MOLEKULARNO BIOLOŠKE METODE V PREHRANI IN ŽIVILSTVU

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Molekularno biološke metode v prehrani in živilstvu
Course title:	Molecular biology methods in nutrition and food science
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037323
Koda učne enote na članici/UL Member course code:	3825

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	5	0	0	15	95	5

Nosilec predmeta/Lecturer:	Anja Klančnik

Izvajalci predavanj:	David Dobnik, Anja Klančnik, Sonja Smole Možina
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

Jeziki/Languages:	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Splošni pogoji za vpis na doktorski študij.	General conditions for enrollment in doctoral studies.

Vsebina:	**Content (Syllabus outline):**
• Molekularne metode določanja gensko spremenjenih organizmov v živilih • Uporabnost različnih principov in molekularnih metod identifikacije, tipizacije in kvantifikacije mikroorganizmov in/ali njihovih produktov v živilih in živilsko-prehranski verigi z namenom sledenja kontaminacije	• Molecular methods of identifying genetically modified organisms in food • Application of different principles and methods for identification, typification and quantification of micro-organisms in food and food chain to trace contamination • Understanding microbial interactions to successfully control the presence of pathogenic

• Razumevanje mikrobnih interakcij za uspešno obvladovanje prisotnosti patogenih bakterij v živilih na več celičnih nivojih z uporabo različnih metodologij	bacteria in food at different cellular levels using various methods

Temeljna literatura in viri/Readings:

- Izbrana poglavja iz: ŽEL, Jana, MILAVEC, Mojca, MORISSET, Dany, PLAN, Damien, EEDE, G. van den, GRUDEN, Kristina. How to reliably test for GMOs, (Springer briefs in food, health, and nutrition). New York [etc.]: Springer, 2012. X, 100 str., ilustr. ISBN 978-1-4614-1389-9. [COBISS.SI-ID 2460239]
- Izbrana poglavja iz: Foodomics : advanced mass spectrometry in modern food science and nutrition. edited by Alejandro Cifuentes A. (ed.). Hoboken, New Jersey, John Wiley & Sons, 2013, 560 str.
- MONNET, Christophe, BOGOVIČ MATIJAŠIĆ, Bojana. Application of PCR-based methods to dairy products and to non-dairy probiotic products. V: HERNÁNDEZ-RODRÍGUEZ, Patricia (ur.), RAMIREZ GOMEZ, Arlen Patricia (ur.). *Polymerase chain reaction*. [Rijeka: Intech, cop. 2012], str. 11-50, doi: 10.5772/36897.
- Quantitative real-time PCR in applied microbiology / ur. Martin Filion, Norfolk : Caister Academic Press, cop. 2012, 242 str.

Revialni in originalni znanstveni članki s področja/Review and original scientific articles from the field.

Cilji in kompetence:	**Objectives and competences:**
Namen predmeta je: - pridobiti znanje o molekularnih metodah za določanje gensko spremenjenih organizmov - spoznati molekularne metode za sledenje mikrobne kontaminacije v živilih in živilsko-prehranski verigi in novejše metode za testiranje in ovrednotenje delovanja naravnih protimikrobnih snovi	The aim of the course is: - to get knowledge about molecular methods for identifying genetically modified organisms in food - to learn about molecular methods for tracing microbial contamination in food and food chain and novel methods for testing and evaluating of natural antimicrobial compounds action

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Študent se bo seznanil s principi molekularno bioloških metod in bo usposobljen za njihovo izvedbo za različne aplikacije na področju živilstva in prehrane.	Knowledge and understanding: The student will be acquainted with the principles of molecular biology methods and be able to use them for different applications in the field of food science and nutrition.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, seminar, diskusije.	Lectures, seminar, discussions.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
• izpit	70,00 %	• exam
• seminar	30,00 %	• seminar

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Anja Klančnik

1. **KLANČNIK, Anja,** ZORKO, Špela, TOPLAK, Nataša, KOVAČ, Minka, BUCAR, Franz, JERŠEK, Barbara, SMOLE MOŽINA, Sonja. Antiadhesion activity of juniper (Juniperus communis L) preparations against Campylobacter jejuni evaluated with PCR-based methods. *Phytotherapy research*, ISSN 1099-1573, 2018, vol. 32, str. 542-550, doi: 10.1002/ptr.6005. [COBISS.SI-ID 4856440]
2. **KLANČNIK, Anja,** ŠIMUNOVIĆ, Katarina, STERNIŠA, Meta, RAMIĆ, Dina, SMOLE MOŽINA, Sonja, BUCAR, Franz. Anti-adhesion activity of phytochemicals to prevent Campylobacter jejuni biofilm

formation on abiotic surfaces. *Phytochemistry reviews*, 2021, vol. 20, str. 55-84, doi: 10.1007/s11101-020-09669-6. [COBISS.SI-ID 5176952]

3. LOVŠIN, Žana, KLANČNIK, Anja, KOTNIK, Tadej. Electroporation as an efficacy potentiator for antibiotics with different target sites. *Frontiers in microbiology*. Oct. 2021, vol. 12, art. no. 722232, str. 1-11, ilustr. DOI: 10.3389/fmicb.2021.722232. [COBISS.SI-ID 79973891]
4. BERLEC, Aleš, JANEŽ, Nikolaja, STERNIŠA, Meta, **KLANČNIK, Anja**, SABOTIČ, Jerica. Expression of NanoLuc luciferase in Listeria innocua for development of biofilm assay. *Frontiers in microbiology*. Feb. 2021, vol. 12, str. 636421-1-636421-9. doi: 10.3389/fmicb.2021.636421. [COBISS.SI-ID 49628675]
5. STERNIŠA, Meta, SABOTIČ, Jerica, **KLANČNIK, Anja**. A novel approach using growth curve analysis to distinguish between antimicrobial and anti-biofilm activities against *Salmonella*. *International journal of food microbiology*, 2022, vol. 364, str. 1-11, doi: 10.1016/j.ijfoodmicro.2021.109520. [COBISS.SI-ID 92026115]
6. ŠIMUNOVIĆ, Katarina, SAHIN, Orhan, EREGA, Andi, ŠTEFANIČ, Polonca, ZHANG, Qijing, MANDIĆ-MULEC, Ines, SMOLE MOŽINA, Sonja, **KLANČNIK, Anja**. Bacillus subtilis PS-216 spores supplemented in broiler chicken drinking water reduce Campylobacter jejuni colonization and increases weight gain. *Frontiers in microbiology*. Jul. 2022, vol. 13, str. 1-11, doi: 10.3389/fmicb.2022.910616. [COBISS.SI-ID 115015683]

Sonja Smole Možina

1. **ŠIMUNOVIĆ**, Katarina, SOLNIER, Julia, ALPERTH, Fabian, KUNERT, Olaf, **SMOLE MOŽINA, Sonja**, BUCAR, Franz. Efflux pump inhibition and resistance modulation in Mycobacterium smegmatis by Peucedanum ostruthium and its coumarins. *Antibiotics*, ISSN 2079-6382, 2021, vol. 10, iss. 9, str. 1-17, ilustr. doi: 10.3390/antibiotics10091075. [COBISS.SI-ID 75651587]
2. STERNIŠA, Meta, BUCAR, Franz, KUNERT, Olaf, **SMOLE MOŽINA, Sonja**. Targeting fish spoilers Pseudomonas and Shewanella with oregano and nettle extracts. *International journal of food microbiology*, .2020, vol. 328, str. 1-8. doi: 10.1016/j.ijfoodmicro.2020.108664. [COBISS.SI-ID 16267779]
3. ŠIMUNOVIĆ, Katarina, RAMIĆ, Dina, XU, Changyun, **SMOLE MOŽINA, Sonja**. Modulation of Campylobacter jejuni motility, adhesion to polystyrene surfaces, and invasion of INT407 cells by quorum-sensing inhibition. *Microorganisms*, 2020, vol. 8, iss. 1, str. 1-14, doi: 10.3390/microorganisms8010104. [COBISS.SI-ID 5147768]
4. EMELE, Matthias Frederik, **SMOLE MOŽINA, Sonja**, LUGERT, Raimond, BOHNE, Wolfgang, MASANTA, Wycliffe Omurwa, RIEDEL, Thomas, GROß, Uwe, BADER, Oliver, ZAUTNER, Andreas Erich. Proteotyping as alternate typing method to differentiate Campylobacter coli clades. *Scientific reports*, 2019, vol. 9, str. 1-11, [e]4244, ilustr., doi: 10.1038/s41598-019-40842-w. [COBISS.SI-ID 5035128]
5. **SMOLE MOŽINA, Sonja**, KLANČNIK, Anja, KOVAČ, Jasna, JERŠEK, Barbara, BUCAR, Franz. Antimicrobial natural products against Campylobacter. V: MERILLON, J. M. (ur.), RIVIÈRE, Céline (ur.). *Natural antimicrobial agents*, (Sustainable development and biodiversity, Vol. 19). Cham: Springer. 2018, str. 3-30. [COBISS.SI-ID 4890744]
6. RAMIĆ, Dina, KLANČNIK, Anja, **SMOLE MOŽINA, Sonja**, DOGŠA, Iztok. Elucidation of the AI-2 communication system in the food-borne pathogen Campylobacter jejuni by whole-cell-based biosensor quantification. *Biosensors & bioelectronics*. 2022, vol. 212, str. 1-8, ilustr. DOI: 10.1016/j.bios.2022.114439. [COBISS.SI-ID 110249219]

David Dobnik

1. **DOBNIK, David**, DEMŠAR, Tina, HUBER, Ingrid, GERDES, Lars, BROEDERS, Sylvia, ROOSENS, Nancy, DEBODE, Frédéric, BERBEN, Gilbert, ŽEL, Jana. Inter-laboratory analysis of selected genetically modified plant reference materials with digital PCR. *Analytical and bioanalytical chemistry*. 2018, vol. 410, iss. 1, str. 211-221. doi: 10.1007/s00216-017-0711-1.
2. **DOBNIK, David**, GRUDEN, Kristina, ŽEL, Jana, BERTHEAU, Yves, HOLST-JENSEN, Arne, BOHANEC, Marko. Decision support for the comparative evaluation and selection of analytical methods : detection of genetically modified organisms as an example. *Food analytical methods*. 2018, vol. 11, no. 8, str. 2105-2122. doi: 10.1007/s12161-018-1194-1.
3. DEMEKE, Tigst, **DOBNIK, David**. Critical assessment of digital PCR for the detection and quantification of genetically modified organisms. *Analytical and bioanalytical chemistry*. 2018, vol. 410, iss. 17, str. 4039-4050. doi: 10.1007/s00216-018-1010-1.
4. MILAVEC, Mojca, **DOBNIK, David**, BOGOŽALEC KOŠIR, Alexandra, ŽEL, Jana. Metrology of DNA approaches. V: BURNS, Malcolm (ur.), FOSTER, Lucy (ur.), WALKER, Michael (ur.). *DNA techniques to verify food authenticity : applications in food fraud*. Cambridge: Royal Society of Chemistry, 2020. Str. 147-153. Food Chemistry, Function and Analysis, 16. http://dx.doi.org/10.1039/9781788016025.

5. **DOBNIK, David**, SPILSBERG, Bjørn, BOGOŽALEC KOŠIR, Alexandra, ŠTEBIH, Dejan, MORISSET, Dany, HOLST-JENSEN, Arne, ŽEL, Jana. Multiplex droplet digital PCR protocols for quantification of GM maize events. V: KARLIN-NEUMANN, George (ur.), BIZOUARN, Francisco (ur.). *Digital PCR : methods and protocols*. New York: Humana Press, 2018. Str. 69-98. Methods in molecular biology, vol. 1768, doi: 10.1007/978-1-4939-7778-9_5.
6. **DOBNIK, David**, KOGOVŠEK, Polona, JAKOMIN, Tjaša, KOŠIR, Nejc, TUŠEK-ŽNIDARIČ, Magda, LESKOVEC, Maja, KAMINSKY, Stephen M., MOSTROM, Janet, LEE, Hyunmi, RAVNIKAR, Maja. Accurate quantification and characterization of adeno-associated viral vectors. *Frontiers in microbiology*. 2019, vol. 10, str. 1-13. doi: 10.3389/fmicb.2019.01570.

MOLEKULSKA FIZIOLOGIJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Molekulska fiziologija
Course title:	Molecular physiology
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037360
Koda učne enote na članici/UL Member course code:	3863

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
20	30	10	0	0	190	10

Nosilec predmeta/Lecturer:	Robert Zorec

Izvajalci predavanj:	Marko Kreft, Robert Zorec
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

Jeziki/Languages:	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij.	General prerequisites for enrolment in doctoral studies.

Vsebina:	Content (Syllabus outline):
Predmet obravnava molekulsko fiziologijo na ravni interakcije celičnih predelkov, na ravni medcelične in sistemske komunikacije v zdravju in bolezni. Predmet poda biološke in biofizikalne temelje organiziranosti celic. Hkrati poda tudi temelje za raziskovalne metode v molekulski fiziologiji, kot so optofiziološke in elektrofiziološke metode. Predstavljene optofiziološke metode so konfokalna mikroskopija za	Subject covers the molecular physiology of subcellular organelle interactions, interactions between cells and interactions at the systems level, all in health and disease. The course brings forward the biological and biophysical foundations for cell organisation. At the same time methods employed in molecular physiology are presented, such as optophysiology and electrophysiology. Among

snemanje v petih dimenzijah: tri prostorske dimenzije, čas in zajemanje spektrov emitirane svetlobe iz živih celic. Predstavljene bodo tudi razmerjemerne metode za spremljanje znotrajcelične aktivnosti kalcija in pH, ki sta pomembna parametra za celično signalizacijo in uravnavanje volumna celic. Z naprednimi optofiziološkimi tehnikami je mogoče spremljati koncentracijo znotrajcelične glukoze, ki je pomemben kazalnik celičnega metabolizma. Elektrofiziološke metode, ki so močno prispevale k znanju na področju molekulske fiziologije, so klasične meritve transmembranske napetosti, metoda »patch-clamp« z meritvami kapacitivnosti, ki omogočajo spremljanje eksocitoze in endocitoze, ter amperometrija za zaznavanje izločanja posameznih kvantov hormonov, nevro- ali glio-transmiterjev. S temi metodami je omogočeno določanje molekulske fiziologije posameznih proteinov, kot so na primer ionski kanali, transporterji, proteini pomembni za eksocitozo in sicer pri normalni fiziologiji ali pri bolezenskih stanjih. Ob tem študent spozna tudi metode izolacije posameznih evkariontskih celic in metode gojenja primarnih in klonalnih kultur za posebne fiziološke meritve in metode za označevanje subceličnih organelov v živih celicah.	optophysiological techniques confocal microscopy for recording in five dimensions is presented: three space dimensions, time and spectral recording of light emission from living cells. Furthermore, methods for recording cytosolic calcium activity, pH, both physiological parameters are crucial in cell signalling and volume regulation. With advanced optical methods cytosolic glucose concentration, an important indicator of cell metabolism can be monitored. Key electrophysiological techniques which have contributed greatly to the field of molecular physiology are classical measurements of transmembrane potential, »patch-clamp« methods of membrane capacitance, which permit the monitoring of exocytosis and endocytosis, amperometric detection of chemical messengers and hormones. These techniques are used to determine molecular physiology of selected proteins, such as ion channels, transporters, proteins required for vesicular traffic and exocytosis, under normal and pathological conditions. Students are acquainted with methods of isolation and culturing of primary and clonal eukaryotic cells and methods for labelling subcellular organelles in vivo.

Temeljna literatura in viri/Readings:

N. Sperelakis (2001). Cell Physiology Source Book: A Molecular Approach. Academic Press; 3rd edition, 1235 strani. ISBN: 0126569770
J. Phillips, P. Murray, P. Kirk (2001). Biology of Disease, 2nd edition, 336 strani. ISBN: 0632054042
Tekoča periodika in zlasti pregledni članki s področij: molekulske fiziologije in raziskovalne tehnologije

Cilji in kompetence:	**Objectives and competences:**
Temeljni izobraževalni cilj je razumevanje funkcije celice v normalnih in patoloških procesih. Pri tem se obravnava raven celičnih predelkov (morfološko določeni organeli in drugi funkcionalni predmeti), raven medcelične in sistemske komunikacije. Študent pridobi kompetence pri obravnavi strategij za preoblikovanje delovanja celic z inženirskimi pristopi in biotehnološkimi metodami.	The educational aim of the course is to understand cell function under normal and pathological conditions. In this the following levels of organisation will be considered: subcellular organelles (morphologically defined structures as well as other functional modules) and the level of cell-to-cell as well as systems communication. Students gain competences in strategies for the biotech engineering and manipulation of cells.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Predviden študijski rezultat je nadgraditi znanje s področja molekulske in celične fiziologije in uporaba novega znanja za preoblikovanje delovanja celic.	Knowledge and understanding: The course is aiming to upgrade the competences and knowledge from the fields of molecular physiology, cell physiology and new advanced methods for cell engineering and manipulation.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, diskusijske delavnice predstavljenih seminarjev, predstavitve v laboratorijih. Pri izvajanju sodelujejo vabljeni predavatelji.	Lectures, workshops with seminars, lab presentations in cooperation with invited lecturers.

Načini ocenjevanja:	Delež/Weight	Assessment:
Pisni izpit iz tem predavanj	50,00 %	Written examination
Predstavitev individualnega projekta	50,00 %	Project presentation

Ocenjevalna lestvica:	Grading system:
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

akad. prof. dr. Robert Zorec

RITUPER, Boštjan, CHOWDHURY HAQUE, Helena, JORGAČEVSKI, Jernej, COORSSEN, Jens R., KREFT, Marko, ZOREC, Robert. Cholesterol-mediated membrane surface area dynamics in neuroendocrine cells. Biochimica et biophysica acta. Molecular and cell biology of lipids, ISSN 1388-1981, Jul. 2013, vol. 1831, iss. 7, str. 1228-1238

MILOŠEVIĆ, Milena, STENOVEC, Matjaž, KREFT, Marko, PETRUŠIĆ, Vladimir, STEVIĆ, Zorica, TRKOV, Saša, ANDJUS, Pavle, ZOREC, Robert. Immunoglobulins G from patients with sporadic amyotrophic lateral sclerosis affects cytosolic Ca2+ homeostasis in cultured rat astrocytes. Cell calcium, ISSN 0143-4160, Jul. 2013, vol. 54, iss. 1, str. 17-25.

POTOKAR, Maja, STENOVEC, Matjaž, JORGAČEVSKI, Jernej, HOLEN, Torgeir, KREFT, Marko, OTTERSEN, Ole Petter, ZOREC, Robert. Regulation of AQP4 surface expression via vesicle mobility in astrocytes. Glia, ISSN 0894-1491, Jun. 2013, vol. 61, iss. 6, str. 917-928, ilustr., doi: 10.1002/glia.22485.

COSTA CALEJO, Ana-Isabel, JORGAČEVSKI, Jernej, KUCKA, Marek, KREFT, Marko, GONÇALVES, Paula P., STOJILKOVIĆ, Stanko, ZOREC, Robert. cAMP-mediated stabilization of fusion pores in cultured rat pituitary lactotrophs. The Journal of neuroscience, ISSN 0270-6474, May 2013, vol. 33, iss. 18, str. 8068-8078, ilustr., doi:10.1523/JNEUROSCI.5351-12.2013.

FLAŠKER, Ajda, JORGAČEVSKI, Jernej, COSTA CALEJO, Ana-Isabel, KREFT, Marko, ZOREC, Robert. Vesicle size determines unitary exocytic properties and their sensitivity to sphingosine. Molecular and cellular endocrinology, ISSN 0303-7207. [Print ed.], 2013, vol. 376, iss. 1/2, str. 136-147,

RITUPER, Boštjan, GUČEK, Alenka, JORGAČEVSKI, Jernej, FLAŠKER, Ajda, KREFT, Marko, ZOREC, Robert. High-resolution membrane capacitance measurements for the study of exocytosis and endocytosis. Nature protocols, ISSN 1754-2189, 2013, vol. 8, no. 6, str. 1169-1183, ilustr., doi: 10.1038/nprot.2013.069.

JORGAČEVSKI, Jernej, KREFT, Marko, VARDJAN, Nina, ZOREC, Robert. Fusion pore regulation in peptidergic vesicles. Cell calcium, ISSN 0143-4160, 2012, vol. 52, iss. 3/4, str. 270-276, doi: 10.1016/j.ceca.2012.04.008.

JORGAČEVSKI, Jernej, POTOKAR, Maja, GRILC, Sonja, KREFT, Marko, ZOREC, Robert, et al. Munc 18-1 tuning of vesicle merger and fusion pore properties. The Journal of neuroscience, ISSN 0270-6474, 2011, vol. 31, issue 24, str. 9055-9066, doi: 10.1523/JNEUROSCI.0185-11.2011.

VELEBIT MARKOVIĆ, Jelena, CHOWDHURY HAQUE, Helena, KREFT, Marko, ZOREC, Robert. Rosiglitazone balances insulin-induced exo- and endocytosis in single 3T3-L1 adipocytes. Molecular and cellular endocrinology, ISSN 0303-7207. [Print ed.], 2011, vol. 333, issue 1, str. 70-77, doi: 10.1016/j.mce.2010.12.014.

JORGAČEVSKI, Jernej, FOŠNARIČ, Miha, VARDJAN, Nina, STENOVEC, Matjaž, POTOKAR, Maja, KREFT, Marko, KRALJ-IGLIČ, Veronika, IGLIČ, Aleš, ZOREC, Robert. Fusion pore stability of peptidergic vesicles. Molecular membrane biology, ISSN 0968-7688, 2010, letn. 27, št. 2/3, str. 65-80, doi: 10.3109/09687681003597104.

prof. dr. Marko Kreft

POTOKAR, Maja, STENOVEC, Matjaž, JORGAČEVSKI, Jernej, HOLEN, Torgeir, KREFT, Marko, OTTERSEN, Ole Petter, ZOREC, Robert. Regulation of AQP4 surface expression via vesicle mobility in astrocytes. Glia, ISSN 0894-1491, Jun. 2013, vol. 61, iss. 6, str. 917-928, ilustr., doi: 10.1002/glia.22485.

POTOKAR, Maja, LACOVICH, Valentina, CHOWDHURY HAQUE, Helena, KREFT, Marko, ZOREC, Robert. Rab4 and Rab5 GTPase are required for directional mobility of endocytic vesicles in astrocytes. Glia, ISSN 0894-1491, 2012, vol. 60, issue 4, str. 594-604, ilustr., doi: 10.1002/glia.22293.

VARDJAN, Nina, GABRIJEL, Mateja, POTOKAR, Maja, ŠVAJGER, Urban, KREFT, Marko, JERAS, Matjaž, DE PABLO, Yolanda, FAIZ, Maryam, PEKNY, Milos, ZOREC, Robert. IFN-gamma-induced increase in the mobility of MHC class II compartments in astrocytes depends on intermediate filaments. Journal of neuroinflammation, ISSN 1742-2094, 2012, vol. 9, art. no. 144, 13 str

COSTA CALEJO, Ana-Isabel, JORGAČEVSKI, Jernej, SILVA, V.S., STENOVEC, Matjaž, KREFT, Marko, GONÇALVES, Paula P., ZOREC, Robert. Aluminium-induced changes of fusion pore properties attenuate prolactin secretion in rat pituitary lactotrophs. Neuroscience, ISSN 0306-4522. [Print ed.], 2012, vol. 201, str. 57-66, ilustr., doi:10.1016/j.neuroscience.2011.11.015.

STENOVEC, Matjaž, MILOŠEVIĆ, M., PETRUŠIĆ, V., POTOKAR, Maja, STEVIĆ, Zorica, PREBIL, Mateja, KREFT, Marko, TRKOV, Saša, ANDJUS, Pavle, ZOREC, Robert. Amyotrophic lateral sclerosis immunoglobulins G enhance the mobility of Lysotracker-labelled vesicles in cultured rat astrocytes. Acta physiologica, ISSN 1748-1708, 2011, vol. 203, issue 4, str. 457-471, ilustr., doi: 10.1111/j.1748-1716.2011.02337.x. [COBISS.SI-ID 28725465],

KOVAČIČ, Petra Brina, CHOWDHURY HAQUE, Helena, VELEBIT MARKOVIĆ, Jelena, KREFT, Marko, JENSEN, Jørgen, ZOREC, Robert. New insights into cytosolic glucose levels during differentiation of 3T3-L1 fibroblasts into adipocytes. The Journal of biological chemistry, ISSN 0021-9258, 2011, vol. 286, no. 15, str. 13370-13381, ilustr., doi:10.1074/jbc.M110.200980.

MOLEKULSKA IN SISTEMSKA BIOLOGIJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Molekulska in sistemska biologija
Course title:	Molecular and systems biolology
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037277
Koda učne enote na članici/UL Member course code:	3779

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
20	20	0	0	20	190	10

Nosilec predmeta/Lecturer:	Nina Gunde Cimerman
Izvajalci predavanj:	Aljoša Bavec, Maja Čemažar, Marina Dermastia, Damjan Glavač, Cene Gostinčar, Kristina Gruden, Nina Gunde Cimerman, Nataša Poklar Ulrih, Boris Rogelj, Kristina Sepčić, Gregor Serša
Izvajalci seminarjev:	Aljoša Bavec, Maja Čemažar, Marina Dermastia, Damjan Glavač, Cene Gostinčar, Kristina Gruden, Nina Gunde Cimerman, Nataša Poklar Ulrih, Boris Rogelj, Kristina Sepčić, Gregor Serša
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	
Vrsta predmeta/Course type:	teoretični/theoretical
Jeziki/Languages:	Predavanja/Lectures: Angleščina, Slovenščina
	Vaje/Tutorial: Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij.	General requirements for the enrolment in PhD program.

Vsebina:	Content (Syllabus outline):
Molekulska in sistemska biologija sta temeljni naravoznanstveni vedi, ki se ukvarjata tako s celicami mikroorganizmov (bakterije, arheje, glive, alge, praživali) kot tudi živalskimi in rastlinskimi celicami	Molecular and systems biology are basic natural sciences, which are focused not only on microbial cells (archaea, bacteria, fungi, algae, protozoa), but also on animal and plant cells, on the level of

na nivoju molekulskih mehanizmov, vloge in strukture različnih molekul in makromolekul, odzivov na različne dejavnike okolja in posledičnih sprememb (regulacija, transkripcija, translacija in posttranslacijski mehanizmi). Raziskovanje je po eni strani usmerjeno v preučevanje normalno delujočih, neokvarjenih celic, po drugi strani pa v iskanje okvar, ki lahko vodijo do vzpostavitve bolezenskega stanja. V okvir molekulske in sistemske biologije spadata tudi področja genomike in metagenomike, ki obravnavata posamezno celico, mikrobne združbe ali tkiva kot nosilce dedne informacije, ki se potencijalno izrazi. Raziskave v okviru področja torej obravnavajo tako posamezne celice, izbrane kot modelni organizmi, kot tudi kompleksnejši nivo mikrobnih združb in tkiv, kar za razumevanje zahteva pristope, ki vključujejo modeliranje bioloških sistemov in sintezo pridobljenega znanja. V okviru predmeta bodo udeleženi izvajalci podrobneje seznanili študente z naborom spodaj navedenih tematik: 1.Molekulske osnove programirane celične smrti pri rastlinah v primerjavi z drugimi celicami, tako prokariontskimi kot evkariontskimi; 2. Prilagoditve ekstremofilnih mikrorganizmov na življenje v ekstremnih razmerah (npr. visoke ali nizke temperature, nizek ali visok pH, povečana slanost, tlak, radiacija) na nivoju makromolekul (proteini, nukleinske kisline, lipidi), v primerjavi z makromolekulami mezofilnih organizmov. Obravnavana bo termodinamska stabilnost naštetih makormolekul, s poudarkom na termodinamski in kinetični stabilnosti proteinov pri procesu zvitja in razvitja ter vlogi nepravilno zvitih proteinov in amiloidov pri različnih boleznih (npr. Parkinsonova bolezen, prionske bolezni); 3. Poznavanje sinteze, procesiranja, transporta in razgradnje RNA. Poznavanje različnih nekodirajočih RNA (mikroRNA, snoRNA in lncRNA) molekul ter razumevanje njihovega delovanja na različnih nivojih regulacije izražanja genov. Biološke in bolezenske funkcije različnih družin RNA (mRNA, miRNA, snoRNA, siRNA).Predstavljena bo regulatorna premreženost RNA, ki verjetno v največji meri vpliva na kompleksne značilnosti organizmov in ima pomembno vlogo pri razvoju, pa tudi pri nastanku bolezni; 4. Primerjava strukture in funkcije nekaterih klinično pomembnih encimov (npr. esteraze)in preučevanje mehanizma delovanja inhibitorjev ter njihova uporaba pri zdravljenju bolezni. Spoznavanje sodobnih encimatskih metod za določanje in analizo kinetičnih parametrov na podatkih večjega obsega; 5.Poznavanje bioloških osnov rasti tumorjev, z opisom značilnih molekularnihi sprememb, kot molekularnimi tarčami za tarčna zdravila. Osnove genske terapije raka in njena uporabnost pri zdravljenju rakavih obolenj;	molecular mechanisms, role and structure of different molecules and macromolecules, responses to different environmental impacts and consequential changes (regulation, transcription, translation and post translational modifications). Research is on one hand focused on studying normally functioning cells, and on the other hand in searching for malfunctions, which can cause diseases. This frame includes also the field of genomics and metagenomics, focused on either individual cells, microbial communities or tissues, as bearers of potentially and selectively expressed genetic information. Investigations therefore include the level of individual cells, acting as model organisms or the more complex level of communities and tissues.Because of the complexity of information, understanding requires an approaches that include modelling of biological systems and synthesis of aquired knowledge. Within the framework of the subject, the participating lecturers will introduce students in more details to a selection of themes listed below: 1.Molecular basis of the programmed cell death in plants in comparison with other cells, both prokaryotic and eukaryotic; 2. Adaptations of extremophilic microorganisms to life in extreme environmental conditions (high or low temperatures, alcalic or acidic pH, high concentration of NaCl, high pressure or radiation) on the level of macromolecules (lipids, proteins, nucleic acids), in comparison with mesophilic homologues. Focus on therodynamic stability of listed biological molecules, with the main emphasis on thermodynamic and kinetic stability of proteins during folding and unfolding, role of misfolded proteins and amiloides in different diseases (Parkinson's disease and prionic diseases); 3. Learning about synthesis, processing, transport and turnover of RNA. Learning about the complex world of non-coding RNA molecules (microRNA, snoRNA and lncRNA) and their multilevel role in the expression of genes. Biological and disease related functions of different RNA families (mRNA, miRNA, snoRNA, siRNA). Presentation of the regulatory networking of RNA, which is likely to have important impact on the complex characteristics of organisms, and plays an important role in development and disease states; 4.Comparison of structure-function relationship of clinically relevant enzymes (e.g. esterases)and the mechanism of action with inhibitors and their role in clinical treatment. Learning about modern enzymatic methods for the determination and analysis of kinetic parameters on large-scale data;; 5. Learning about tumors, with the description of characteristic molecular changes, as molecular targets for target drugs. Basics of cancer gene therapy and its usefuleness in treating different types of cancer;

6. Spoznavanje genomike mikroorganizmov, s poudarkom na splošnih razlikah med prokariontskimi in evkariontskimi genomi, načini določanja genomskih zaporedij, metodami primerjave genomskih zaporedij. S primeri iz prakse bodo ponazorjene analize, ki jih omogočajo sodobna bioinformatska orodja na področju genomike in primerjalne genomike. 7. Spoznavanje biologije v post-genomskem obdobju, s poudarki na novih tehnologijah določanja nukleotidnega zaporedja, pristopi v metagenomiki, pristopi v metatranskriptomiki, genomiki posamezne celice, metagenomiki vodnih okolij, tal, sedimentov, človeka in metaviriomi. Področje tudi obsega uvod v Linux, sestavljanje in anotacijo prokariontskih genomov, analizo metagenomskih podatkovnih zbirk, sestavljanje in analizo metagenomske DNA; 8. Modeliranje v bioloških sistemih s spoznavanjem baz znanja, ki jih lahko uporabljamo, tipi formalizmov in njihovo namembnostjo, orodji za dinamično in strukturno modeliranje bioloških sistemov, pridobivanje eksperimentalnih podatkov za podporo modeliranju. 9. Zgradba in funkcionalna asimetrija bioloških membran, lipidne mikrodomene, interakcije proteinov z membranam, sodobne tehnike za študij umernih in bioloških membran in njihovih gradnikov.	6.Learning about genomics of microorganisms, with emphasis on general differences between the genomes of prokaryotes and eukaryotes, approaches to genome sequencing, methods of comparative genomics. Analyses made possible by modern bioinformatic tools in the fields of genomics and comparative genomics with illustration based on practical examples; 7.learning about post-genomic biology, new sequencing techniques, approaches in metagenomics, approaches in metatranscriptomics, single cell genomics, aquatic metagenomics, soil metagenomics, sediment metagenomics, human metagenomics, metavirioms, introduction to Linux, assembly and annotation of prokaryotic genomes, analysis of metagenomic libraries, assembly and annotation of metagenomic DNA; 8. Modelling in systems biology: knowledge bases used in molecular modelling, formalisms used in modelling of biological systems, tools available for structural and dynamic modelling and experimental data acquisition to support modelling. 9. Structure and functional asymmetry of biological membranes, lipid microdomains, protein-membrane interactions, modern techniques for studying artificial and biological membranes and their components.

Temeljna literatura in viri/Readings:

Novejši znanstveni pregledni in eksperimentalni članki s področja, druga učna gradiva in spodaj navedene knjige ter pregledni članki.
Recent review scientific and experimental papers, literature from the field, text books, and books and review articles listed below.

Knjige/Books:

1. Bioinformatics: Sequence and Genome Analysis, 2nd edition, David W. Mount. Cold Spring Harbor Laboratory Press. Bioinformatics. Sequence and genome analysis (PDF) (pdfroom.com)
3. Eberhard Voit A First Course in Systems Biology, Garland Science, 2012; A First Course in Systems Biology | Eberhard Voit | Taylor & Francis e (taylorfrancis.com)
4. Dermastia, Marina. Pogled v rastline. Ljubljana: Nacionalni inštitut za biologijo, 2010. 237 str., ilustr. ISBN 978-961-92543-4-9. pp 1-74.
4. Radiobiology for Radiologists. E Hall and Amato J. Gaccia, seventh edition, Wolters Kluwer and Lippincott, 2012The Basic Science of Oncology. Fifth edition, Tannock I, Hill R, Bristow R, Harrington L. Mc Graw Hill 2013; Eric J. Hall and Amato J. Giaccia: Radiobiology for the radiologist | Physical and Engineering Sciences in Medicine (springer.com)
5. David L. Nelson Lehninger, Michael M. Cox: Principles of Biochemistry Seventh Edition, Freeman, 2017; Download Lehninger Principles of Biochemistry 7th Edition PDF FREE - Medical Study Zone

Članki/Papers:

Revijalni članki s področja, tekoča periodika ter druga učna gradiva
Specifično našteti članki:

1. Dinger ME. Long non-coding RNAS in disease and development. Pathology. 2014 Feb;46 Suppl 1:S26.
2. Uversky, V. (2011) Intrinsically disordered proteins from A to Z. International Journal of Biochemistry & Cell Biology 43, 1090-1103.4. Baggio LL, Drucker DJ. Biology of incretins: GLP-1 and GIP. Gastroenterology. 2007 May;132(6):2131-57.5. Zinman B. Newer insulin analogs: advances in basal insulin replacement. Diabetes Obes Metab 2013;15(Suppl. 1):6–10.Strojan, Hočevar ured.: Onkologija [Elektronski vir] : učbenik za študente medicine, Ljubljana : Onkološki inštitut = Institute of Oncology, 2018, SBN - 978-961-7029-06-2; COBISS.SI-ID – 294451456; https://www.onko-i.si/fileadmin/onko/datoteke/Strokovna_knjiznica/publikacije_za_bolnike/Onkologija_ucbenik_za_studente_medicine_2018.pdf

3. Harrington L, Tannock I.F., Hill R.P., Cescon D. (2021). The Basic Science of Oncology. 6th ed. McGraw-Hill Professional. pp 558, ISBN: 978-1259862076.
4. Weinberg R.A. (2014). The Biology of Cancer. ISBN 978-0-8153-4219-9
5. Petrič B et al. Investigation of Paraoxonase-1 Genotype and Enzyme-Kinetic Parameters in the Context of Cognitive Impairment in Parkinson's Disease. Antioxidants. 2023;12(2): 399.
6. Petrič B, Goličnik M, Bavec A. The Removal of Time-Concentration Data Points from Progress Curves Improves the Determination of Km: The Example of Paraoxonase 1. Molecules. 2022;27(4):1306

Cilji in kompetence:

Študent se bo poglobil v ožjo raziskovalno področje, ki ga bo nadgrajeval v svoji doktorski disertaciji. Predmet ni namenjen ekstenzivnemu širjenju teoretičnega znanja, pač pa je cilj predstavitev določene problematike ter metod in pristopov, ki lahko pripomorejo k rešitvi znanstvenih problemov. Namenjen je tudi poznavanju predhodnih raziskav s področja bodoče doktorske disertacije študenta. Med cilje predmeta spada posredovanje ključne znanstvene literature iz področja izbrane znanstvene tematike, vključno s posredovanjem lastnega raziskovalčevega znanja in pomoč pri analizi eksperimentalno pridobljenih podatkov.

Specifični cilji:

- pridobivanje specialnih znanj s področja arhejske, bakterijske, glivne, živalske in rastlinske celice,
- poznavanje fizikalnih zakonitosti, ki določajo stabilnost bioloških makromolekul v ekstremnih razmerah,
- poznavanje različnih nekodirajočih RNA (mikroRNA, snoRNA in lncRNA) molekul in ter razumevanje njihovega delovanja na različnih nivojih regulacije izražanja genov,
- razumevanje molekulskih mehanizmov delovanja klinično pomembnih peptidov. Razumevanje, da kemijske modifikacije naravnih peptidov lahko vodijo v nastanek biološko bolj učinkovitih molekul, ki so pomembne pri zdravljenju bolezni
- razumevanje molekularnih mehanizmov in interakcijskih sistemov, ki so vpleteni v biogenezo, transport, delovanje in razgradnjo različnih družin RNA. Vpogled v bolezensko pomembne procese in načine zdravljenja.
- razumevanje osnovnih značilnosti mikrobnih genomov in metod za njihovo analizo, Prepoznavanje možnosti za temeljna in uporabna spoznanja, ki jih nudi preučevanje genomov in omejitev tega pristopa (česar na podlagi genomskega zaporedja (še) ni mogoče ugotoviti)
- pridobitev poglobljenega vpogleda v metagenomiko in raziskovalne možnosti, ki jih omogoča..
- seznanitev s področjem sistemske biologije, vključno z metodološkimi pristopi v eksperimentalnem delu kot tudi v analizi podatkov ter modeliranju.

Objectives and competences:

Students will get deeper insight into the research area which he or she will upgrade in her/his doctoral thesis. The contents are not intended to extensively broaden theoretical knowledge, instead it should present specific problematic research areas and indicate methods and approaches which can facilitate solving of scientific problems. Student should get also familiar with previous research in the field of their doctoral thesis.
One of the aims is to mediate key scientific literature from the chosen scientific field, including mediation of the lecturer's own experience and help in the analyses of experimentally obtained data.

Specific aims:

- gain of special knowledge associated with archeal, bacterial, fungal, animal and plant cell,
- learning about the physical laws that determine the stability of biological macromolecules at extreme environmental conditions,
- learning about the complex world of non-coding RNA molecules (microRNA, snoRNA and lncRNA) and their multilevel role in the expression of genes,
- understanding the molecular mechanisms of clinically important peptides. Understanding that chemical modifications of natural peptides can change the biological activity of the native peptides and consequently lead to more efficient clinical therapy,
- understanding the molecular mechanisms and interaction systems involved in biogenesis, transport, function and turnover of different families of RNA. To gain insight into disease significant processes and methods of treatment
- understanding the basic characteristics of microbial genomes and methods for their analysis. Recognising the potentials for basic and applicable outcomes of genomic analyses and their limitations (what cannot (yet) be discerned on the basis of the genomic sequence).
- gaining an in-depth insight into metagenomics and its research applications
- familiarizing with the field of systems biology, including wet and dry lab methodologies.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Zgoraj opisan pristop se mora odraziti v pravilnem načrtovanju raziskav in poskusov, ki vodijo k preiskusu hipotez zastavljenih v temi doktorske disertacije, poznavanju izbrane raziskovalne tematike, sposobnosti razlage najpomembnejših principov in interpretacije pridobljenih rezultatov. Znanje in razumevanje: razumevanje delovanja programov celične smrti pri rastlinah v primerjavi s programi celične smrti pri živalih in prokariontih, razumevanje stabiliziranja makromolekul ekstremofilnih mikroorganizmov, razumevanje regulatorne premreženosti RNA, ki verjetno v največji meri vpliva na kompleksne značilnosti organizmov in ima pomembno vlogo pri razvoju, pa tudi pri nastanku bolezni, razumevanje molekulskih mehanizmov, ki omogočajo delovanje peptidov v celicah in poznavanje uporabe peptidov pri zdravljenju bolezni, razumevanje dinamike sinteze in procesiranja RNA ter pomembnih funkcij različnih družin RNA, razumevanje značilnosti mikrobnih genomov, različnih (osnovnih) pristopov v analizi genomskih zaporedij in različnih (osnovnih) pristopov v primerjavi genomskih zaporedij, Razumevanje metagenomike kot porajajoče se znanost in kot raziskovalno orodje, pregled metodologije sistemske biologije in sposobnost ugotavljanja primernosti različnih pristopov za reševanje specifičnih problemov modeliranja bioloških sistemov.	Such an approach should result in the proper planning of research experiments which should enable testing of the hypotheses raised in the doctoral thesis, familiarity with the chosen research area, capability to explain the main principles and interpretation of the obtained results. Knowledge and understanding: understanding of plant cell death programs in comparison with programs in animal and microbial cells, understanding of macromolecular stabilisation of extremophiles, understanding of regulatory networking of RNA, likely to have an important impact on the complex characteristics of organisms, and in development of different diseases, understanding of the molecular mechanisms which enable peptides to exert their cell function and identification of peptides as clinically important molecules, understandinging of dynamics of RNA synthesis and processing, as well as of the crucial functions of different families of RNAs, understanding of characteristics of microbial genomes, of different (basic) approches for genomic sequence analysis and of different (basic) approches for genomic sequence comparison, Understanding of importance of metagenomics and its use in different research fields, acquirement of an overview of existing methodology in systems biology and the ability to identify the best methodlogical approach availabile for solving specific problems of biological systems modeling.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Priprava in vodenje razprav o prebranih znanstvenih člankih, diskusije in konzultacije glede reševanja raziskovalnih problemov z metodo razlage, razgovora, demonstracije, dela s teksti, učenja z informacijskimi viri, raziskovalno učenje.. Predstavitev praktičnega raziskovalnega problema in poteka njegove analize s sprotno predstavitvijo relevantnih znanj, ki so za proces potrebna.	Preparation and supervision of Journal clubs, discussion and consultation in relation to scientific problems with explanations, discussions, demonstrations, text work, informatics, research learning. Describing a real-life research problem and the stages of its solving, with accompanying explanation of the relevant knowledge, important in the process.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
- oddaja rešene problemske naloge	40,00 %	- presentation of problem solution,
- sodelovanje na journal club-ih	20,00 %	- participation at journal clubs
- aktivna udeležba na znanstvenih srečanjih.	40,00 %	- active participation at scientific meetings.

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Nina Gunde –Cimerman

1. ČERNOŠA, Anja, GOSTINČAR, Cene, LAVRIN, Teja, KOSTANJŠEK, Rok, LENASSI, Metka, GUNDE-CIMERMAN, Nina. Isolation and characterization of extracellular vesicles from biotechnologically important fungus Aureobasidium pullulans. *Fungal biology and biotechnology*. 2022, vol. 9, str. 1-17, ilustr. ISSN 2054-3085. https://doi.org/10.1186/s40694-022-00146-7, DOI: 10.1186/s40694-022-00146-7. [COBISS.SI-ID 127741955]
2. JIMÉNEZ-GÓMEZ, Irina, VALDÉS-MUÑOZ, Gisell, MORENO-ULLOA, Aldo, PÉREZ-LLANO, Yordanis, MORENO-PERLÍN, Tonatiuh, SILVA-JIMÉNEZ, Hortencia, BARRETO-CURIEL, Fernando, RAYO SÁNCHEZ-CARBENTE, María del, FOLCH-MALLOL, Jorge Luis, GUNDE-CIMERMAN, Nina, LAGO-LESTÓN, Asunción, BATISTA-GARCÍA, Ramón Alberto. Surviving in the brine : a multi-omics approach for understanding the physiology of the halophile fungus Aspergillus sydowii at saturated NaCl concentration. *Frontiers in microbiology*. May 2022, vol. 13, str. 1-24, ilustr. ISSN 1664-302X. https://doi.org/10.3389/fmicb.2022.840408, DOI: 10.3389/fmicb.2022.840408. [COBISS.SI-ID 107812355]
3. SCHALK, Felix, GOSTINČAR, Cene, KREUZENBECK, Nina B., CONLON, Benjamin H., SOMMERWERK, Elisabeth, RABE, Patrick, BURKHARDT, Immo, KRÜGER, Thomas, KNIEMEYER, Olaf, BRAKHAGE, Axel A., GUNDE-CIMERMAN, Nina, DE BEER, Z. Wilhelm, DICKSCHAT, Jeroen S., POULSEN, Michael, BEEMELMANNS, Christine. The termite fungal cultivar Termitomyces combines diverse enzymes and oxidative reactions for plant biomass conversion. *mBio*. 2021, vol. 12, iss. 3, str. 1-17. ISSN 2150-7511. DOI: 10.1128/mBio.03551-20. [COBISS.SI-ID 68499459]
4. ČERNOŠA, Anja, SUN, Xiaohuan, GOSTINČAR, Cene, FANG, Chao, GUNDE-CIMERMAN, Nina, SONG, Zewei. Virulence traits and population genomics of the black yeast Aureobasidium melanogenum. *Journal of fungi*. 2021, vol. 7, iss. 8, str. 1-22. ISSN 2309-608X. https://www.mdpi.com/2309-608X/7/8/665, DOI: 10.3390/jof7080665. [COBISS.SI-ID 73727235]
5. TOUCHETTE, D., ALTSHULER, I., GOSTINČAR, Cene, ZALAR, Polona, RAYMOND-BOUCHARD, I., ZAJC, Janja, MCKAY, C. P., GUNDE-CIMERMAN, Nina, WHYTE, Lyle G. Novel Antarctic yeast adapts to cold by switching energy metabolism and increasing small RNA synthesis. *The ISME journal*. 2021, vol. 16, str. 221-231, ilustr. ISSN 1751-7370. https://doi.org/10.1038/s41396-021-01030-9, DOI: 10.1038/s41396-021-01030-9. [COBISS.SI-ID 72620035]
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2. MEHLE, Nataša, KAVČIČ, Sanda, MERMAL, Sara, VIDMAR, Sara, POMPE NOVAK, Maruša, RIEDLE-BAUER, Monika, BRADER, Günter, KLADNIK, Aleš, **DERMASTIA, Marina**. Geographical and temporal diversity of 'Candidatus Phytoplasma solani' in wine-growing regions in Slovenia and Austria. Frontiers in plant science. Mai 2022, vol. 13, str. 1-12, ilustr. ISSN 1664-462X. https://doi.org/10.3389/fpls.2022.889675, DOI: 10.3389/fpls.2022.889675. [COBISS.SI-ID 109003011]
3. **DERMASTIA, Marina**, ŠKRLJ, Blaž, STRAH, Rebeka, ANŽIČ, Barbara, TOMAŽ, Špela, KRIŽNIK, Maja, SCHÖNHUBER, Christina, RIEDLE-BAUER, Monika, RAMŠAK, Živa, PETEK, Marko, KLADNIK, Aleš, LAVRAČ, Nada, GRUDEN, Kristina, ROITSCH, Thomas, BRADER, Günter, POMPE NOVAK, Maruša. Differential response of grapevine to Infection with 'Candidatus Phytoplasma solani' in early and late growing season through complex regulation of mRNA and small RNA transcriptomes. International journal of molecular sciences. 1 Apr. 2021, vol. 22, no. 7, str. 3531-1-3531-28. ISSN 1661-6596. https://www.mdpi.com/1422-0067/22/7/3531. [COBISS.SI-ID 58895619]
4. ŠKRLJ, Blaž, POMPE NOVAK, Maruša, BRADER, Günter, ANŽIČ, Barbara, RAMŠAK, Živa, GRUDEN, Kristina, KRALJ, Jan, KLADNIK, Aleš, LAVRAČ, Nada, ROITSCH, Thomas, **DERMASTIA, Marina**. New cross-talks between pathways involved in grapevine infection with 'Candidatus Phytoplasma solani' revealed by temporal network modelling. Plants. Apr. 2021, vol. 10, iss.

4, str. 646-1- 646-18, ilustr. ISSN 2223-7747. https://www.mdpi.com/2223-7747/10/4/646, DOI: 10.3390/plants10040646. [COBISS.SI-ID 58899971]

5. **DERMASTIA, Marina**. Plant hormones in phytoplasma infected plants. Frontiers in plant science. 2019, vol. 10, str. 1-15. ISSN 1664-462X. DOI: 10.3389/fpls.2019.00477. [COBISS.SI-ID 5050959]
6. ROTTER, Ana, NIKOLIĆ, Petra, TURNŠEK, Neža, KOGOVŠEK, Polona, BLEJEC, Andrej, GRUDEN, Kristina, **DERMASTIA, Marina**. Statistical modeling of long-term grapevine response to "Candidatus Phytoplasma solani" infection in the field. European journal of plant pathology. 2018, vol. 150, iss.3, str. 653-668. ISSN 0929-1873. http://dx.doi.org/10.1007/s10658-017-1310-x, DOI: 10.1007/s10658-017-1310-x. [COBISS.SI-ID 4396623]

Gregor Serša

1. Djokic M, Cemazar M, Popovic P, Kos B, Dezman R, Bosnjak M, Zakelj MN, Miklavcic D, Potrc S, Stabuc B, Tomazic A, Sersa G, Trotovsek B. Electrochemotherapy as treatment option for hepatocellular carcinoma, a prospective pilot study.Eur J Surg Oncol. 2018 May;44(5):651-657. doi: 10.1016/j.ejso.2018.01.090. Epub 2018 Feb 2.
2. Campana LG, Edhemovic I, Soden D, Perrone AM, Scarpa M, Campanacci L, Cemazar M, Valpione S, Miklavčič D, Mocellin S, Sieni E, Sersa G. Electrochemotherapy - Emerging applications technical advances, new indications, combined approaches, and multi-institutional collaboration. Eur J Surg Oncol. 2019 Feb;45(2):92-102. doi: 10.1016/j.ejso.2018.11.023
3. Kos S, Lopes A, Preat V, Cemazar M, Lampreht Tratar U, Ucakar B, Vanvarenberg K, Sersa G, Vandermeulen G. Intradermal DNA vaccination combined with dual CTLA-4 and PD-1 blockade provides robust tumor immunity in murine melanoma. PLoS One. 2019 May 31;14(5):e0217762. doi: 10.1371/journal.pone.0217762. eCollection 2019.
4. Sersa G, Ursic K, Cemazar M, Heller R, Bosnjak M, Campana LG. Biological factors of the tumour response to electrochemotherapy: Review of the evidence and a research roadmap. Eur J Surg Oncol. 2021 Aug;47(8):1836-1846. doi: 10.1016/j.ejso.2021.03.229. Epub 2021 Mar 11. PMID: 33726951.
5. Groselj A, Bosnjak M, Krzan M, Kosjek T, Bottyán K, Plesnik H, Jamsek C, Cemazar M, Kis E, Sersa G. Bleomycin Concentration in Patients' Plasma and Tumors after Electrochemotherapy. A Study from InspECT Group. Pharmaceutics. 2021 Aug 24;13(9):1324. doi: 10.3390/pharmaceutics13091324. PMID: 34575400; PMCID: PMC8469090.
6. Ursic K, Kos S, Kamensek U, Cemazar M, Miceska S, Markelc B, Bucek S, Staresinic B, Kloboves Prevodnik V, Heller R, Sersa G. Potentiation of electrochemotherapy effectiveness by immunostimulation with IL-12 gene electrotransfer in mice is dependent on tumor immune status. J Control Release. 2021 Apr 10;332:623-635. doi: 10.1016/j.jconrel.2021.03.009. Epub 2021 Mar 8. PMID: 33705828.

Maja Čemažar

1. ČEMAŽAR, Maja, AMBROŽIČ, Jerneja, PAVLIN, Darja, SERŠA, Gregor, POLI, Alessandro, KRHAČ LEVAČIĆ, Ana, TEŠIĆ, Nataša, LAMPREHT TRATAR, Urša, RAK, Mitja, TOZON, Nataša. Efficacy and safety of electrochemotherapy combined with peritumoral IL-12 gene electrotransfer of canine mast cell tumours. Veterinary and comparative oncology, ISSN 1476-5810, Jun. 2017, vol. 15, iss. 2, str. 641-654, doi: 10.1111/vco.12208.
2. ČEMAŽAR, Maja, SERŠA, Gregor, FREY, Wolfgang, MIKLAVČIČ, Damijan, TEISSIÉ, Justin. Recommendations and requirements for reporting on applications of electric pulse delivery for electroporation of biological samples. Bioelectrochemistry, ISSN 1567-5394. [Print ed.], Aug. 2018, vol. 122, str. 69-76, doi: 10.1016/j.bioelechem.2018.03.005.
3. MARKELC, Boštjan, BELLARD, Elisabeth, SERŠA, Gregor, JESENKO, Tanja, PELOFY, Sandrine, TEISSIE, Justin, FRANGEŽ, Robert, ROLS, Marie-Pierre, ČEMAŽAR, Maja, GOLZIO, Muriel. Increased permeability of blood vessels after reversible electroporation is facilitated by alterations in endothelial cell-to-cell junctions. Journal of controlled release, ISSN 0168-3659. [Print ed.], 2018, str. 1-30. doi: 10.1016/j.jconrel.2018.02.032.
4. 231. Lampreht Tratar U, Horvat S, Cemazar M. Transgenic Mouse Models in Cancer Research. Front Oncol. 2018 Jul 20;8:268. doi: 10.3389/fonc.2018.00268. eCollection 2018. Review.
5. Semenova N, Bosnjak M, Markelc B, Znidar K, Cemazar M, Heller L. Multiple cytosolic DNA sensors bind plasmid DNA after transfection.Nucleic Acids Res. 2019 Sep 9. pii: gkz768. doi: 10.1093/nar/gkz768. [Epub ahead of print]
6. Heller L, Bulysheva A, Arpag S, Sales Conniff A, Kohena K, Shi G, Semenova N, Heller R, Cemazar M. Growth environment influences B16.F10 mouse melanoma cell response to gene electrotransfer. Bioelectrochemistry. 2021 Aug;140:107827. doi: 10.1016/j.bioelechem.2021.107827. Epub 2021 Apr 26. PMID: 33971375; PMCID: PMC8237338.

MULTIVARIATNE STATISTIČNE METODE

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Multivariatne statistične metode
Course title:	Multivariate statistical methods
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037301
Koda učne enote na članici/UL Member course code:	3803

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	0	35	0	0	80	5

Nosilec predmeta/Lecturer:	Damijana Kastelec

Izvajalci predavanj:	Damijana Kastelec
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

Jeziki/Languages:	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Potrebno je znanje osnovne statistike.	Knowledge of basic statistics is required.

Vsebina:	Content (Syllabus outline):
Moderni grafični prikazi. Analiza povezanosti in odvisnosti: korelacijska analiza, enostavna regresija, multipla regresija. Metode za raziskovanje podatkov: razvrščanje v skupine, večrazsežnostno lestvičenje. Metode za zmanjšanje razsežnosti prostora: metoda glavnih komponent, korespondenčna analiza. Metode za analizo skupin: diskriminantna analiza, faktorska analiza.	Modern graphics for data presentation. Analysis of correlation and dependence: correlation analysis, simple regression, multiple regression. Data exploratory analyses: cluster analysis, multidimensional scaling. Methods for lowering the dimension of space: principal component analysis, correspondence analysis.

	Methods for analyses of groups: discriminant analysis, factor analysis.

Temeljna literatura in viri/Readings:

FERLIGOJ, Anuška. *Razvrščanje v skupine : teorija in uporaba v družboslovju*, (Zbirka Metodološki zvezki, 4). Ljubljana: Fakulteta za sociologijo, politične vede in novinarstvo, Raziskovalni inštitut, 1989. 182 str. http://dk.fdv.uni-lj.si/metodoloskizvezki/Pdfs/Mz_4Ferligoj.pdf. [COBISS.SI-ID 13947648]
Aktualni znanstveni članki izbrani v tekočem šolskem letuKastelec D. in Košmelj K.: Študijsko gradivo za predmet Multivariatne statistične metode (pdf datoteke na USB ključku in v spletni učilnici)
Priporočeno gradivo:
Johnson R. A., Wichern D. W. (2002): Applied multivariate statistical analysis, Prentice Hall, New Jersy, 767 str.
R Core Team (2022). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/..

Cilji in kompetence:	**Objectives and competences:**
Cilj predmeta je seznaniti študenta s koncepti, postopki in statističnimi metodami za hkratno analizo več spremenljivk.	The main objective is an overview of concepts and statistical methods for analysis of multivariate data.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: študent nadgradi znanje osnovne statistike z znanjem zahtevnejših statističnih metod in pristopov. Poudarek je na uporabi ustrezne metode, na interpretaciji rezultatov ter na uporabi modernih programskih orodij.	Knowledge and understanding: students upgrade basic knowledge of statistics with modern statistical and computing approaches. The focus is on the choice of appropriate methods, on the interpretation of the results and of the use of modern tools for statistical computing.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Pouk je v računalniški učilnici, pri pouku se uporablja moderna programska oprema. Domače delo.	Lectures in computer room; modern software is used. Home work.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Izpit v računalniški učilnici.	80,00 %	Exam in computer laboratory.
Seminarska naloga	20,00 %	Seminar assignment

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

izr. prof. dr. Damijana Kastelec

1. PEČAN, Urša, KASTELEC, Damijana, PINTAR, Marina. Evaluation of default, soil-specific, and clay content correction calibration functions for dielectric sensors in soils with differing properties. Journal of irrigation and drainage engineering. [Print ed.]. 2022, vol. 148, iss. 6 (04022016), 11 str., ilustr. ISSN 0733-9437. https://ascelibrary.org/doi/epdf/10.1061/%28ASCE%29IR.1943-4774.0001677, DOI: 10.1061/(ASCE)IR.1943-4774.0001677. [COBISS.SI-ID 102113795], [JCR, SNIP, WoS, Scopus]
2. ČEBULJ, Anka, VANZO, Andreja, HLADNIK, Jože, KASTELEC, Damijana, VRHOVŠEK, Urška. Apple (Malus domestica Borkh.) cultivar 'Majda', a naturally non-browning cultivar : an assessment of its qualities. Plants. 9 Jul. 2021, vol. 10, iss. 7, str. 1-17, ilustr. ISSN 2223-7747. https://www.mdpi.com/2223-7747/10/7/1402, DOI: 10.3390/plants10071402. [COBISS.SI-ID 69911299], [JCR, SNIP, WoS, Scopus]

3. KAURIN, Anela, GLUHAR, Simon, MAČEK, Irena, KASTELEC, Damijana, LEŠTAN, Domen. Demonstrational gardens with EDTA-washed soil. Part II, Soil quality assessment using biological indicators. Science of the total environment. 2021, vol. 792, str. 1-9 (148522). ISSN 0048-9697. DOI: 10.1016/j.scitotenv.2021.148522. [COBISS.SI-ID 68311811], [JCR, SNIP, WoS do 29. 11. 2022: št. citatov (TC): 3, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0,40, Scopus do 29. 11. 2022: št. citatov (TC): 4, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0,40]
4. 5. GLUHAR, Simon, KAURIN, Anela, FINŽGAR, Neža, GERL, Marko, KASTELEC, Damijana, LEŠTAN, Domen. Demonstrational gardens with EDTA-washed soil. Part I, Remediation efficiency, effect on soil properties and toxicity hazards. Science of the total environment. 2021, vol. 792, str. 1-12 (149060). ISSN 0048-9697. DOI: 10.1016/j.scitotenv.2021.149060. [COBISS.SI-ID 72788227], [JCR, SNIP, WoS do 3. 1. 2023: št. citatov (TC): 9, čistih citatov (CI): 6, čistih citatov na avtorja (CIAu): 1,00, Scopus do 12. 12. 2022: št. citatov (TC): 11, čistih citatov (CI): 6, čistih citatov na avtorja (CIAu): 1,00]
5. 6. GLUHAR, Simon, KAURIN, Anela, VODNIK, Dominik, KASTELEC, Damijana, ZUPANC, Vesna, LEŠTAN, Domen. Demonstration gardens with EDTA-washed soil. Part III, Plant growth, soil physical properties and production of safe vegetables. Science of the total environment. 2021, vol. 792, str. 1-14 (148521). ISSN 0048-9697. DOI: 10.1016/j.scitotenv.2021.148521. [COBISS.SI-ID 68308739], [JCR, SNIP, WoS do 29. 11. 2022: št. citatov (TC): 5, čistih citatov (CI): 3, čistih citatov na avtorja (CIAu): 0,50, Scopus do 27. 11. 2022: št. citatov (TC): 5, čistih citatov (CI): 3, čistih citatov na avtorja (CIAu): 0,50]
6. TRDIN, Ajda, SNOJ TRATNIK, Janja, STAJNKO, Anja, MARC, Janja, MAZEJ, Darja, SEŠEK-BRIŠKI, Alenka, KASTELEC, Damijana, PRPIĆ, Igor, PETROVIĆ, Oleg, ŠPIRIĆ, Igor, HORVAT, Milena, FALNOGA, Ingrid. Trace elements and APOE polymorphisms in pregnant women and their new-borns. Environment international. [Print ed.]. 2020, vol. 143, str. 105626-1-105626-13. ISSN 0160-4120. https://www.sciencedirect.com/science/article/pii/S0160412019337468?via%3Dihub, DOI: 10.1016/j.envint.2020.105626. [COBISS.SI-ID 24060675], [JCR, SNIP, WoS do 4. 12. 2022: št. citatov (TC): 3, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0,19, Scopus do 24. 11. 2022: št. citatov (TC): 3, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0,19]
financer: ARRS, P1 0143; ARRS, J7-9400; University of Rijeka, Croatia, 13.06.1.2.25; Ministry of Science and Education of Republic of Croatia, Croatia, 062- 0000000-3395
7. KLOPČIČ, Matija, POLJANEC, Aleš, DOLINAR, Mojca, KASTELEC, Damijana, BONČINA, Andrej. Ice-storm damage to trees in mixed Central European forests : damage patterns, predictors and susceptibility of tree species. Forestry. Jan. 2020, vol. 93, iss. 3, str. 430-443. ISSN 0015-752X. https://doi.org/10.1093/forestry/cpz068, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=114878, DOI: 10.1093/forestry/cpz068. [COBISS.SI-ID 5637286], [JCR, SNIP, WoS do 26. 10. 2022: št. citatov (TC): 5, čistih citatov (CI): 5, čistih citatov na avtorja (CIAu): 1,00, Scopus do 3. 3. 2022: št. citatov (TC): 6, čistih citatov (CI): 5, čistih citatov na avtorja (CIAu): 1,00]
8. BERNE, Sabina, KOVAČEVIĆ, Nataša, KASTELEC, Damijana, JAVORNIK, Branka, RADIŠEK, Sebastjan. Hop polyphenols in relation to Verticillium wilt resistance and their antifungal activity. Plants. 2020, vol. 9, no. 10, str. 1-21 (1318). ISSN 2223-7747. https://www.mdpi.com/2223-7747/9/10/1318, DOI: 10.3390/plants9101318. [COBISS.SI-ID 31470595], [JCR, SNIP, WoS do 19. 1. 2023: št. citatov (TC): 4, čistih citatov (CI): 4, čistih citatov na avtorja (CIAu): 0,80, Scopus do 11. 7. 2022: št. citatov (TC): 2, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0,40]

NAČRTOVANJE RAZISKOVALNEGA DELA IN PRIPRAVA PROJEKTA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Načrtovanje raziskovalnega dela in priprava projekta
Course title:	Research planning and elaboration of a project proposal
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code: 0643133

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	20	0	0	15	80	5

Nosilec predmeta/Lecturer: Damjana Drobne

Izvajalci predavanj:	Damjana Drobne
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type: teoretični/theoretical

Jeziki/Languages:	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij	General conditions for the enrolment

Vsebina:	Content (Syllabus outline):
-Podroben pregled raziskav in razpisov na prioritetnih področjih EU npr. Okolje in zdravje: • Pregled projektov in rezultatov projektov, ki jih je razpasla in financirala EU v svojih programih • Seznanitev s strateškimi programi za raziskave in inovacije v okviru EU	-A detailed overview of project calls within EU priority areas e.g. Environment and Health: -Overview of projects and results of projects funded by the EU in strategic programs -Familiarisation with the EU's strategic research and innovation programs

• Seznanitev z raziskavami in inovacije v podporo kemijski zakonodaji • Seznanitev s strategijo za trajnostni razvoj ter raziskavami in inovacijami, ki podpirajo akcijski načrt za odpravo onesnaževanja Seznanitev s pobudami in smernicami, ki so osnova vsem EU in (mnogim) nacionalnim razpisom projektov: To so: • Evropska zelena pogodba • Novi evropski Bauhaus • Evropska kemijska strategija za trajnost • Krožno gospodarstvo. Predstavitev konceptov kot so: • SSbD »*Safe and susistainable by design*« • Transdisciplinaren pristop • Odprta znanost • FAIR podatki Podroben pregled izbranega razpisa, pogojev razpisa in pregled primera ocene projekta ter seznanitev z načini poročanja.	-Familiarisation with research and innovation in support of chemical legislation - Familiarisation with the Sustainable Development Strategy and the research and innovation supporting the Action Plan on Zero Pollution Familiarisation with the initiatives and roadmaps that underpin all EU and (many) national calls for projects: These are: -European Green Deal -The new European Bauhaus -European Chemical Strategy for Sustainability -The Circular Economy. Introducing concepts such as: -SSbD "Safe and sustainable by design" -Transdisciplinary approach -Open Science -FAIR data Detailed analysis of one selected call, the call conditions and an overview of the project evaluation case study, as well as an introduction to the reporting requirements.

Temeljna literatura in viri/Readings:

https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en
https://www.consilium.europa.eu/en/press/press-releases/2021/03/15/council-approves-conclusions-on-the-eu-chemicals-strategy-for-sustainability/
https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/home
https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/programmes/horizon
Pregled razpisov na področju raziskav in inoviranja H2020 EU https://ec.europa.eu/research-and-innovation/en/horizon-magazine

Environment and health: Initiatives, projects, results and publications related to environment and health research and innovation. https://ec.europa.eu/info/research-and-innovation/research-area/health-research-and-innovation/environment-and-health_en

Cilji in kompetence:	**Objectives and competences:**
Slušatelj bo spodoben • Pregledati spletne strani EU komisije in podobno in poiskati ustrezne razpise projektov • Razumeti osnove komuniciranja med različnimi strokami, predvsem med naravoslovjem in družboslovjem • Oblikovati zasnovo raziskovalnega projekta • Razumeti pojem odprte znanosti, koncepta ponovne uporabe podatkov, razlikovati med podatki, informacijami in vedenjem, pomen upravljanja s podatki • Razumeti koncept in pristope pri zagotavljanju FAIR podatkov, pomen digitalizacije pri laboratorijskem delu	The participant will get knowledge to: • Check EU Commission websites for relevant calls • Understand the basics of communication between different disciplines, in particular between the natural and social sciences • Develop a research project design • Understand the concept of open science, the concept of data reuse, the distinction between data, information and knowledge, the importance of data management • Understand the concept and approaches in providing FAIR data, the importance of digitization in laboratory work

Predvideni študijski rezultati:	**Intended learning outcomes:**

Znanje in razumevanje: - Poiskati projekti razpis - Razumeti pogoje razpisa, princip poročanja o poteku raziskovalnem delu in o porabi sredstev skladno z razpisnimi pogoji - Sposobnost dogovarjanja med partnerji in izbira načina komuniciranja in odločanja - Sposobnost predstaviti rezultate raziskovalnega dela	Knowledge and understanding: - Find projects call - Understand the terms of the call, the principles of reporting on the progress of the research work and the use of funds in accordance with the terms of the call - Ability to communicate with project partners to make decisions - Understanding how to present and disseminate the results of the research work

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja in vodena razprava	Predavanja in vodena razprava

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Sodelovanje v razpravi	50,00 %	Participation in the discussion
Poročilo	50,00 %	Report

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Sodelovanje v skupinah (*clustrih*) projektov na področju upravljanja s podatki:

1. Izvajalka je predstavnica projekta **PlasticFatE** (2021-2025, Horizont 2020, RIA 965367) v CUSP skupini 5-ih EU H2020 projektov za področje upravljanja s podatki za namene ponovne rabe; https://cusp-research.eu/
2. Izvajalka vodi delovni sklop o podatkih v projektu **NanoRIGO** (2019-2024, Horizont 2020, RIA 814530) (https://cordis.europa.eu/project/rcn/220129/factsheet/en) in je zato tudi predstavnica projekta **NanoRIGO** (2019-2024, Horizont 2020, RIA 814530) (https://cordis.europa.eu/project/rcn/220129/factsheet/en) v skupini treh NMBP-13 H2020 projektov na področju upravljanja s podatki

Znanstvene objave, kjer je predstavljeno in zajeto širše področje raziskovanja kot produkt velikega projekta:
DROBNE, Damjana. Spotlighting CLH report for TiO2 : nano-safety perspective. Chemical engineering journal, ISSN 1385-8947, 15 May **2018**, vol. 340, str. 192-195, doi: 10.1016/j.cej.2018.01.007.
BALLARIN, … **DROBNE, Damjana**, ….. VARELA COELHO, Ana. Maristem - stem cells of marine/aquatic invertebrates : from basic research to innovative applications. Sustainability, ISSN 2071-1050, **2018**, vol. 10, str. 1-21
PINSINO, Annalisa, …., **DROBNE, Damjana**,…. , et al. Probing the immune responses to nanoparticles across environmental species : a perspective of the EU Horizon 2020 project PANDORA. Environmental science, Nano, ISSN 2051-8153, **2020**, vol. 7, iss. 11, str. 3216-3232
DROBNE, Damjana. Adding toxicological context to nanotoxicity study reporting using the nanotox metadata list. *Small*. 19 Feb. **2021**, vol. 17, iss. 11, str. 1-8, ilustr. ISSN 1613-6829. DOI: 10.1002/smll.202005622. [COBISS.SI-ID 52578051].

NAČRTOVANJE RAZISKOVALNEGA DELA IN PRIPRAVA PROJEKTA – PRAKTIČNO DELO

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Načrtovanje raziskovalnega dela in priprava projekta – praktično delo
Course title:	Research planning and elaboration of a project proposal - practical course
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code: 0643132

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
5	10	0	0	10	100	5

Nosilec predmeta/Lecturer: Damjana Drobne

Izvajalci predavanj:	
Izvajalci seminarjev:	Damjana Drobne
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type: individualno raziskovalni /individual research course

Jeziki/Languages:	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Teoretični predmet Načrtovanje raziskovalnega dela in priprava projekta	Theoritcal cours Research planning and elaboration of a project proposal

Vsebina:	**Content (Syllabus outline):**
1. Pisanje preglednega članka na podlagi pregleda literature (Uporaba podatkovnih virov, pregled pristopov pri ocenjevanju virov, sinteza in zaključki)	**1. Writing a review article based on a literature review** (Use of data sources, review of approaches to source evaluation, synthesis and conclusions).

2. Priprava recenzija preglednega članka, ki vsebuje odgovore na izbrana vprašanja: 1. Ali sta v povzetku in uvodu jasno opredeljena potreba po tej raziskavi in njena pomembnost? 2. Ali je metodologija ustrezno usmerjena na glavno(-a) vprašanje(-a)? 3. Ali so rezultati predstavljeni jasno in logično ter ali so utemeljeni s predloženimi podatki? 4. Ali so slike jasne in v celoti opisane? 4. Ali sklepi utemeljeno odgovarjajo na glavna vprašanja, ki jih je avtor(ji) postavil(i) v uvodu 5. Ali je na vprašanja, postavljena v Uvodu, v Sklepih ustrezno odgovorjeno.	**2. Preparation of a peer-reviewed review article answering selected questions:** 1. Does the abstract and introduction clearly identify the need for this research and its relevance? 2. Does the methodology adequately address the main question(s)? 3. Are the results presented in a clear and logical manner and are they justified by the data provided? 4. Are the figures clear and fully described? 4. Do the conclusions reasonably address the main questions raised by the author(s) in the introduction? 5. Are the questions raised in the Introduction adequately answered in the Conclusions.
3. Pisanje predloga raziskave (pregled nekaj obstoječih obrazcev razpisov ARRS in H2020 EU) Predlog vsebuje naslednje elemente: - Povzetek ali izvleček, problem, vprašanje ali hipoteza - Metodologija raziskave - Etični vidiki - Analiza informacij / opis analize vzorca - Omejitve in ključne predpostavke - Reference ali bibliografija	**3. Writing the research proposal (review of some existing ARRS and H2020 EU call forms)** The proposal contains the following elements: - Abstract or abstract, problem, question or hypothesis - Research methodology - Ethical considerations - Analysis of information / description of sample analysis - Limitations and key assumptions - References or bibliography
4. Izdelava recenzija raziskovalnega predloga, ki vsebuje vrednotenje naslednjih elementov: A. povzetek (recenzentovih) ugotovitev, vključno s prednostmi in slabostmi predloga; B. ocena predloga glede na merila za ocenjevanje; splošnih ciljev predloga, metod, vprašanj, hipotez, čarovnice, finančnih sredstev (stroškovna učinkovitost).	**4. to produce a peer-reviewed research proposal that includes an evaluation of the following elements**: A. A summary of (the reviewer's) findings, including the strengths and weaknesses of the proposal; B. an assessment of the proposal against the evaluation criteria; overall aims of the proposal, methods, questions, hypotheses, magic bullet, financial resources (cost-effectiveness).

Temeljna literatura in viri/Readings:

Kako pisati pregledni članke in kako pristopati h pregledu literature /How to write Literature Review
https://guides.lib.uoguelph.ca/c.php?g=130964&p=5000948
https://www.scribbr.com/dissertation/literature-review/
https://www.grammarly.com/blog/literature-review/
Kako recenzirati znanstveni članek /How to review a scientific paper
https://pubs.acs.org/doi/10.1021/acs.chas.0c00107
https://www.nature.com/articles/d41586-018-06991-0
Kako pisati predlog projekta / How to write a project proposal
https://www.grammarly.com/blog/how-to-write-a-research-proposal/?gclid=CjwKCAiA24SPBhB0EiwAjBgkhjhrh1T_lVhTOusCuBX7oc8TZrdPwCgzITZPkTZprlaI4rRcQcsy2RoCM2QQAvD_BwE&gclsrc=aw.ds
https://parkerderrington.com/get-the-framework-in-place-quickly/
https://www.auckland.ac.nz/en/education/study-with-us/study-options/doctoral-programmes/research-proposal-structure.html
Kako recenzirati projektni predlog / How to review a proposal
https://redteamconsulting.com/2019/04/22/10-tips-proposal-reviews/
https://parkerderrington.com/get-the-framework-in-place-quickly/
Andrew (2014, May 19). Review a research grant-application in five minutes. Retrieved from:
https://parkerderrington.com/peer-review-your-own-grant-application-in-five-minutes/

Cilji in kompetence:	Objectives and competences:
Kandidati znajo pripraviti pregled literature, napisati pregledni članek, pregledati znanstveni članek, napisati raziskovalni predlog, pregledati raziskovalni predlog. Kandidati so sposobni: • Razumeti osnove komuniciranja med različnimi strokami, med naravoslovjem in družboslovjem in koncept so-ustvarjanja pri obsežnih projektih, ki naslavljajo širše družben izzive • Oblikovati zasnovo raziskovalnega projekta • Razumeti pojem odprte znanosti, koncepta ponovne uporabe podatkov, razlikovati med podatki, informacijami in vedenjem, pomen upravljanja s podatki • Razumeti koncept in pristope pri zagotavljanju FAIR podatkov, pomen digitalizacije pri laboratorijskem delu	Candidates are able to conduct a literature review, write a review article, review a scientific article, write a research proposal and review a research proposal. Candidates are able to: - Understand the basics of communication between different disciplines, between the natural and social sciences and the concept of co-creation in large-scale projects addressing broader societal challenges. - To develop the design of a research project - Understand the concept of open science, the concept of data re-use, the distinction between data, information and knowledge, the importance of data management - Understand the concept and approaches in providing FAIR data and the importance of digitization in laboratory work

Predvideni študijski rezultati:	Intended learning outcomes:
Znanje in razumevanje: • Priprave znanstvenega projekta • Iskanje in analiza literature, ki je osnova za pričetek oblikovanja projekta • Poročanje o poteku raziskovalnem delu • Predstavitev rezultatov raziskovalnega dela	Knowledge and understanding: - Writing a scientific project - Literature search and analysis of literature as a basis for project proposal - Reporting on the progress of the research work - Presentation of the results of the research work

Metode poučevanja in učenja:	Learning and teaching methods:
Navodila za pripravo izdelkov, predstavitve izdelkov, vodena razprava in navodila za izboljšave	Instructions for preparation of review papers and project proposals, presentations, guided discussion and instructions for improvements

Načini ocenjevanja:	Delež/Weight	Assessment:
Kakovost štirih pisnih dokumentov	60,00 %	Quality of four written documents
Predstavitve	20,00 %	Presentations
Sodelovanje v razpravi	20,00 %	Participation in the discussion

Ocenjevalna lestvica:	Grading system:
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

1) Izvajalka je vodilna slovenka partnerica v petih zaključenih in dveh tekočih H2020 projektih:
1. 2011-2015 Large-scale integrating EU FP7 project NanoValid (263147) http://www.nanovalid.eu/
2. 2013-2017 Large-scale integrating EU FP7 project NanoMile (310451) http://nanomile.eu-vri.eu/
3. 2015-2019 Horizont 2020, RIA NanoFASE (http://nanofase.eu/)
4. 2019-2024 Horizont 2020, RIA NanoRIGO, (814530) (https://cordis.europa.eu/project/rcn/220129/factsheet/en)
5. 2015-2019 Horizont 2020, MSCA-ITN-2015; Marie-Sklodowska-Curie Actions; Pandora (http://www.pandora-h2020.eu/)
6. 2021-2025 Horizont 2020, RIA PlasticFatE (965367), https://www.plasticsfate.eu/

7. 2022-2026 Horizont Europe, RIA NOVA
8. 2022-2026 Horizont Europe, RIA REPOXIBLE

Koorditorica:

1. 2023-2026 Horizont Europe, RIA ACCORDs

2) Izvajalka je vodila oz. vodi skupaj 6 ARRS projektov in je sodelovala oz. sodeluje v skupaj več kot 30-ih ARRS projektih.

3) Članki, ki vsebujejo pregled področja:

- BALLARIN, Loriano, …., **DROBNE, Damjana**. Stem cells and innate immunity in aquatic invertebrates : bridging two seemingly disparate disciplines for new discoveries in biology. Frontiers in immunology, ISSN 1664-3224, **2021**, vol. 12, str. 1-24.
- **DROBNE, Damjana.** Adding toxicological context to nanotoxicity study reporting using the nanotox metadata list. Small, ISSN 1613-6829,. **2021**, 2005622, str. 1-8.
- KRANJC, Eva, **DROBNE, Damjana**. Nanomaterials in plants: a review of hazard and applications in the agri-food sector. Nanomaterials, ISSN 2079-4991. **2019**, vol. 9, iss. 8, str. 1-33, ilustr. https://www.mdpi.com/2079-4991/9/8/1094.

NANOTEHNOLOGIJE IN BIO-NANO INTERAKCIJE

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Nanotehnologije in bio-nano interakcije
Course title:	Nanotechnology and bio-nano interactions
Članica nosilka/UL Member:	UL FE

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037322
Koda učne enote na članici/UL Member course code:	3824

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
20	0	0	0	40	190	10

Nosilec predmeta/Lecturer:	Damjana Drobne

Izvajalci predavanj:	Damjana Drobne
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

Jeziki/Languages:	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij	General conditions for enrollment in doctoral study

Vsebina:	Content (Syllabus outline):
1. Uvod: Uporaba nanomaterialov in nanostrukturiranih površin v sodobnih tehnoloških procesih (živilska industrija, farmacija, avtomobilska industrija, medicinska uporaba) 2. Tipi nanomaterialov: Polimeri, koloidi in amfifili v vodnih raztopinah: lastnosti in karakterizacija; sile v koloidnih sistemih; interakcije in strukture v mešanih sistemih, ki vsebujejo polimere in	1. Introduction: application of nanomaterials and nanostructured surfaces in modern technological processes (food industry, pharmaceuticals, automotive industry, medical applications) 2. Types of nanomaterials: Polymers, colloids and amphiphiles in aqueous solutions: properties and characterisation; forces in colloidal systems; interactions and structures in mixed systems containing polymers and surfactants; experimental

površinsko aktivne snovi; eksperimentalne metode za študij interakcij; primeri kompleksnih asociirajočih sistemov v tehniki in naravi 3. Od nanomaterialov do naprednih materialov 4. Specifične fizikalne in kemijske lastnosti nanodelcev 5. Metode za detekcijo nanodelcev v zraku in tekočem mediju 6. Interakcije med nanodelci in celico, tkivom in organizmom: *in vivo* ter *in vitro* študije 7. Korelacija med lastnostmi nanodelcev (odmerek, površina, oblika, velikost,…) in odgovorom biološkega sistema 8. Zagotavljanje kvalitete podatkov o nano– in naprednih materialov 9. »Safe and sustainable by design (SSbD)« na področju nano– in naprednih materialov 10. »Life cycle assessmnt (LCA)« na področju nano– in naprednih materialov 11. Upravljanje s tveganji (Risk governance) na področju nano– in naprednih materialov	methods for studying interactions; examples of complex associating systems in engineering and nature 3. From nanomaterials to advanced materials 4. Specific physical and chemical properties of nanoparticles 5. Methods for the detection of nanoparticles in air and liquid media 6. Interactions between nanoparticles and the cell, tissue and organism: in vivo and in vitro studies 7. Correlation between nanoparticle properties (dose, surface area, shape, size, etc.) and the response of the biological system 8. Quality assurance of data on nano- and advanced materials 9. "Safe and sustainable by design (SSbD)" in the field of nano- and advanced materials 10. Life cycle assessment (LCA)" in the field of nano- and advanced materials 11. Risk governance in the field of nano- and advanced materials

Temeljna literatura in viri/Readings:

Aktualni znanstveni članki s področja, ki jih sproti določijo izvajalci predmeta. Scientific papers.

Cilji in kompetence:	**Objectives and competences:**
Izobraževalni cilji: Študent bo sposoben razumeti različna področja nanotehnologij in nanobiologije. Glede na osnovna študentova predznanja, bo ta poglobil in nadgradil s spoznanji drugih naravoslovnih disciplin. Če bo študentova doktorska naloga s področja nanoznanosti, bo pri predmetu pridobil vrhunsko znanje za razumevanje problemov in dogajanj na tem področju in jih bo sposoben reševati z vrhunskimi znanstvenimi pristopi. Študijski rezultati: Študentje bodo zmožni razumeti in rešiti znanstvena vprašanja s področja nanoznanosti ter prenesti rezultate raziskav v prakso. Pridobili bodo osnovne veščine pisanja znanstvenih publikacij. Sposobni bodo komunicirati z javnostjo na področju interpretacije problemov in rešitev, ki se nanašajo na področje nanoznanosti in bio-nanointerakcij.	Objectives: Students will gain specific knowledge regarding different areas of nanotechnology and nanobiology. This background will be complementary to those of other natural sciences. The course will provide an indespensible background for those students whose doctoral thesis will be done in this area od research. Results: Students will be able to comprehend and resolve nano-related scientific problems and transfer the solutions to the industry sector. They will gain basic knowledge and skills in the preparation of scientific publications. They will be able to communicate nanoscience and bionanointeraction related content to the interested public.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Razumevanje razvoja in uporabe novih materialov. Razumevanje pomena varnosti izdelkov, ki vsebujejo nove matirale.	Knowledge and understanding: Understanding the development and use of new materials. Understanding the importance of the safety of products containing new matrials.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, diskusije, delavnice, predstavitve v laboratorijih.	Lectures, discussions, workshops, laboratory demonstrations.

Načini ocenjevanja: **Delež/Weight** **Assessment:**

Predstavitev individualnega projekta	50,00 %	Project presentation
Diskusija, ustni izpit	50,00 %	Discussion, oral exam

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Damjana Drobne

BORASCHI, Diana, CANESI, Laura, DROBNE, Damjana, KEMMERLING, Birgit, PINSINO, Annalisa, PROCHAZKOVA, Petra. Interaction between nanomaterials and the innate immune system across evolution. *Biological reviews*. ilustr. ISSN 1469-185X. **2023**, DOI: 10.1111/brv.12928. [COBISS.SI-ID 139240195].

KOKOL, Vanja, NOVAK, Sara, KONONENKO, Veno, KOS, Monika, VIVOD, Vera, GUNDE-CIMERMAN, Nina, DROBNE, Damjana. Antibacterial and degradation properties of dialdehyded and aminohexamethylated nanocelluloses. *Carbohydrate polymers*. Available online 21 January 2023, DOI: 10.1016/j.carbpol.2023.120603. [COBISS.SI-ID 139361027]

JEMEC KOKALJ, Anita, DOLAR, Andraž, DROBNE, Damjana, ŠKRLEP, Luka, SEVER ŠKAPIN, Andrijana, MAROLT, Gregor, NAGODE, Ana, GESTEL, Cornelis A. M. van. Effects of microplastics from disposable medical masks on terrestrial invertebrates. *Journal of hazardous materials*. **2022**. DOI: 10.1016/j.jhazmat.2022.129440. [COBISS.SI-ID 113941763].

REPAR, Neža, LI, Hao, AGUILAR, Jose S., LI, Qingshun Quinn, DROBNE, Damjana, HONG, Yiling. Silver nanoparticles induce neurotoxicity in a human embryonic stem cell-derived neuron and astrocyte network. *Nanotoxicology*. **2018**, DOI: 10.1080/17435390.2018.1425497. [COBISS.SI-ID 4582991]

IMANI, Roghayeh, DILLERT, Ralph, BAHNEMANN, Detlef W., PAZOKI, Meysam, APIH, Tomaž, KONONENKO, Veno, REPAR, Neža, KRALJ-IGLIČ, Veronika, BOSCHLOO, Gerrit, DROBNE, Damjana, EDVINSSON, Tomas, IGLIČ, Aleš. Multifunctional gadolinium-doped mesoporous TiO2 nanobeads ephotoluminescence, enhanced spin relaxation, and reactive oxygen species photogeneration, beneficial for cancer diagnosis and treatment. *Small*. 2017. ISSN 1613-6810. DOI: 10.1002/smll.201700349. [COBISS.SI-ID 30414375].

KONONENKO, Veno, ERMAN, Andreja, PETAN, Toni, KRIŽAJ, Igor, KRALJ, Slavko, MAKOVEC, Darko, DROBNE, Damjana. Harmful at non-cytotoxic concentrations : SiO2-SPIONs affect surfactant metabolism and lamellar body biogenesis in A549 human alveolar epithelial cells. *Nanotoxicology*. **2017**, DOI: 10.1080/17435390.2017.1309704. [COBISS.SI-ID 30433319]

NARAVNA ZDRAVILA IZ GLIV, RASTLIN IN ŽIVALI

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Naravna zdravila iz gliv, rastlin in živali
Course title:	Natural medicines from fungi, plants and animals
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037290
Koda učne enote na članici/UL Member course code:	3792

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	30	0	0	5	80	5

Nosilec predmeta/Lecturer:	Kristina Sepčić

Izvajalci predavanj:	Andrej Gregori, Samo Kreft, Kristina Sepčić, Borut Štrukelj
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

Jeziki/Languages:	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Končan univerzitetni ali drugostopenjski bolonjski študij iz širšega področja naravoslovja, matematike in računalništva oziroma ožjega področja Vede o živi naravi (klasifikacija po Klasius-u).	Completed university studies or bologna masters in natural sciences, mathematics and computer studies or the narrower field of life sciences (Klasius classification).

Vsebina:	**Content (Syllabus outline):**
Predstavljene bodo naslednje vsebine: 1. Zdravilne učinkovine rastlinskega izvora in rastlinski izvlečki s poudarkom pa klinično potrjenih primerih uporabe zdravilnih rastlin, njihova izolacija, molekularni način delovanja in uporaba v terapevtske namene;	The following contents will be presented and siscussed: 1. Medicinal substances from plants as well as plant crude extracts will be presented in terms of their strucure/activity realtionship, therapeutic use and clinical importance;

2. Pomen gob v kitajski tradicionalni medicini in po svetu, vrste medicinskih gob, biotehnološki postopki gojenja, ekstrakcija aktivnih komponent iz gliv (encimi, polisaharidi, lektini, antioksidanti, terpenoidi, proteoglikani in proteinski derivati), uporaba prehranskih dopolonil za preventivne in kurativne namene ter lajšanje simptomov antitumorske terapije, ter priprava preparatov v obliki tinktur, praškov ali kapsul; 3. Sinteza, pomen, pridobivanje in biološka aktivnost naravnih produktov živalskega izvora, s posebnim povdarkom na spojinah iz morskih živali. Uporaba naravnih produktov morskega izvora in živalskih toksinov v biomedicini, biotehnologiji, farmakologiji in industriji.	2. The importance of mushrooms in Chinese traditional medicine and worldwide, species of medicinal mushrooms, biotechnological methods of their cultivation, extraction of active components from fungi (enzymes, polysaccharides, lectins, antioxidants, terpenoids, proteoglycans and protein derivatives), the use of nutrition supplements for preventive and curative purposes and relieve the symptoms of antitumour therapies, and preparation of fungal products in the form of tinctures, powders or capsules; 3. The synthesis, biological significance, purification and biological activity of natural products from animal sources. Particular emphasis will be given to natural products deriving from marine animals. The use of marine natural products and animal toxins in biomedicine, biotechnology, pharmacology and industry.

Temeljna literatura in viri/Readings:

Učbenik: Sodobna fitoterapija, urednika: Samo Kreft, Nina Glavač Hočevar, SFD, 2013, *ISBN*: 978-961-92900-5-7/ Monograph: Modern Phytotherapy, SFD 2013, Samo Kreft, Nina Glavač Hočevar, eds; *ISBN*: 978-961-92900-5-7
Pregledni članki in novejši znanstveni članki s področja/Review papers and recent scientific papers

Cilji in kompetence:	**Objectives and competences:**
Študent se bo poglobil v ožjo raziskovalno problematiko, ki jo bo nadgrajeval v svoji doktorski disertaciji. Predmet ni namenjen ekstenzivnemu širjenju teoretičnega znanja, pač pa je cilj predstavitev določenih problemov in obvladovanje specifičnih metod in tehnik, ki lahko pripomorejo k rešitvi problemom. Namenjen je tudi poznavanju pregleda predhodnih raziskav s področja bodoče doktorske disertacije študenta.	Students will get deeper insight into research problems which he or she will upgrade in her/his doctoral thesis. The contents are not intended to extensively broaden the theoretical knowledge but should introduce specific problems, indicate methods and techniques with which the problem can be addressed. Students should get familiar with previous research in the field of their doctoral thesis.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Zgoraj opisan pristop se mora odraziti v pravilnem načrtovanju raziskav in poskusov, ki vodijo k preizkusu hipotez zastavljenih v temi doktorske disertacije.	Knowledge and understanding: Such an approach should result in the proper planning of research experiments which can test the hypotheses raised in the doctoral thesis.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Neposredna predavanja naštetih nosilcev (vsak 2.5 uri), priprava in vodenje Journal clubov; priprava problemskih nalog, diskusije in konzultacije glede njihovega reševanja. Pregled in poprava rešitev problemskih nalog.	Frontal ex-cathedra teaching (2.5 hr per lecturer); preparation and supervision of Journal clubs; preparation of problem tasks, discussion and consultation. Asesement and correction of problem solutions.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Oddaja rešene problemske naloge,	50,00 %	Presentation of problem solution,
sodelovanje na journal club-ih.	50,00 %	participation at journal clubs.

Ocenjevalna lestvica:	Grading system:
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Kristina Sepčić:

1. SAFA, Neda, TROBEC, Tomaž, HOLLAND, Darren C., SLAZAK, Blazej, JACOBSSON, Erik, HAWKES, Jeffrey A., FRANGEŽ, Robert, SEPČIĆ, Kristina, GÖRANSSON, Ulf, MOODIE, Lindon W. K., ROBERTSON, Luke P. Spatial distribution and stability of cholinesterase inhibitory protoberberine alkaloids from Papaver setiferum. *Journal of natural products*, ISSN 1520-6025. [Online ed.], 2021, str. [1-10], ilustr. doi: 10.1021/acs.jnatprod.1c00980. [COBISS.SI-ID 89689603].
2. MOODIE, Lindon W. K., SEPČIĆ, Kristina, TURK, Tom, FRANGEŽ, Robert, SVENSON, Johan. Natural cholinesterase inhibitors from marine organisms. *Natural product reports*, ISSN 0265-0568., 2019, vol. , iss. , 40 str., doi: 10.1039/c9np00010k. [COBISS.SI-ID 5024335].
3. ELUMALAI, Vijayaragavan, TROBEC, Tomaž, GRUNDNER, Maja, LABRIERE, Christophe, FRANGEŽ, Robert, SEPČIĆ, Kristina, HANSEN, Jørn H., SVENSON, Johan. Development of potent cholinesterase inhibitors based on a marine pharmacophore. *Organic & biomolecular chemistry*. [Online ed.]. 2022, vol. 20, no. 28, str. 5589-5601, ilustr. ISSN 1477-0539. https://pubs.rsc.org/en/content/articlepdf/2022/ob/d2ob01064j, DOI: 10.1039/d2ob01064j. [COBISS.SI-ID 114793219]
4. ARABSHAHI, Homayon John, TROBEC, Tomaž, FOULON, Valentin, HELLIO, Claire, FRANGEŽ, Robert, SEPČIĆ, Kristina, CAHILL, Patrick, SVENSON, Johan. Using virtual AChE homology screening to identify small molecules with the ability to inhibit marine biofouling. *Frontiers in marine science*. 2021, vol. 8, str. 1-12, art. 762287, ilustr. ISSN 2296-7745. https://www.frontiersin.org/articles/10.3389/fmars.2021.762287/full, DOI: 10.3389/fmars.2021.762287. [COBISS.SI-ID 89164547]
5. MOGROVEJO, Diana C., PERINI, Laura, GOSTINČAR, Cene, SEPČIĆ, Kristina, TURK, Martina, AMBROŽIČ, Jerneja, BRILL, Florian H. H., GUNDE-CIMERMAN, Nina. Prevalence of antimicrobial resistance and hemolytic phenotypes in culturable Arctic bacteria. *Frontiers in microbiology*. 3 Apr. 2020, vol. 3, article 570, str. 1-13, ilustr. ISSN 1664-302X. https://www.frontiersin.org/articles/10.3389/fmicb.2020.00570/full, DOI: 10.3389/fmicb.2020.00570. [COBISS.SI-ID 40581125]
6. MARIČ, Ajda, SKOČAJ, Matej, LIKAR, Matevž, SEPČIĆ, Kristina, KRALJ CIGIĆ, Irena, GRUNDNER, Maja, GREGORI, Andrej. Comparison of lovastatin, citrinin and pigment production of different Monascus purpureus strains grown on rice and millet. *Journal of Food Science and Technology*. 2019, vol. , no. , 10 str., [in press], ilustr. ISSN 0022-1155. DOI: 10.1007/s13197-019-03820-8. [COBISS.SI-ID 5097295].

Andrej Gregori:

1. CÖR, Darija, BOTIĆ, Tanja, KNEZ, Željko, GREGORI, Andrej, POHLEVEN, Franc. The effects of different solvents on bioactive metabolites and "in vitro" antioxidant and anti-acetylcholinesterase activity of ganoderma lucidum fruiting body and primordia extracts. *Macedonian journal of chemistry and chemical engineering*. 2017, vol. 36, no. 1, str. 1-13. ISSN 1857-5552.
2. MARIČ, Ajda, SKOČAJ, Matej, LIKAR, Matevž, SEPČIĆ, Kristina, KRALJ CIGIĆ, Irena, GRUNDNER, Maja, GREGORI, Andrej. Comparison of lovastatin, citrinin and pigment production of different Monascus purpureus strains grown on rice and millet. *Journal of Food Science and Technology*. 2019, vol. , no., 10 str., [in press], ilustr. ISSN 0022-1155.
3. RODA, Elisa, GREGORI, Andrej, COBELLI, Filippo, BORSCI, Giuseppina, PRIORI, Erica Cecilia, CHINOSI, Silvia, RONCHI, Andrea, FRANCO, Renato, BERRETTA, Massimiliano, SICILIANI, Stella, et al. Novel medicinal mushroom blend as a promising supplement in integrative oncology : a multi-tiered study using 4T1 triple-negative mouse breast cancer model. *International journal of molecular sciences*. May 2020, vol. 21, no. 10, str. 1-28, ilustr. ISSN 1422-0067.
4. WELLHAM, Peter A. D., HAFEEZ, Abdul, GREGORI, Andrej, BROCK, Matthias, KIM, Dong-Hyun, DE MOOR, Cornelia, et al. Culture degeneration reduces sex-related gene expression, alters metabolite production and reduces insect pathogenic response in cordyceps militaris. *Microorganisms*. 2021, vol. 9, iss. 8, str. 1-22. ISSN 2076-2607.
5. BEROVIČ, Marin, BOH PODGORNIK, Bojana, GREGORI, Andrej. Cultivation technologies for production of medicinal mushroom biomass : review. *International journal of medicinal mushrooms*. 2022, vol. 24,

iss. 2, str. 1-22, ilustr. ISSN 1521-9437. https://www.dl.begellhouse.com/journals/708ae68d64b17c52,3f8126ab22b0f590,648efc4c721cff46.html, DOI: 10.1615/IntJMedMushrooms.2021042445. [COBISS.SI-ID 96135939]
6. WELLHAM, Peter A. D., HAFEEZ, Abdul, GREGORI, Andrej, BROCK, Matthias, KIM, Dong-Hyun, DE MOOR, Cornelia, et al. Culture degeneration reduces sex-related gene expression, alters metabolite production and reduces insect pathogenic response in cordyceps militaris. *Microorganisms*. 2021, vol. 9, iss. 8, str. 1-22. ISSN 2076-2607. https://www.mdpi.com/2076-2607/9/8/1559/htm. [COBISS.SI-ID 74311683]

Borut Štrukelj:

1. PLAVEC, Tina Vida, MITROVIĆ, Ana, PERIŠIĆ, Milica, ŠTRUKELJ, Borut, KOS, Janko, BERLEC, Aleš. Targeting of fluorescent Lactococcus lactis to colorectal cancer cells through surface display of tumour-antigen binding proteins. Microbial biotechnology, ISSN 1751-7915. [Online ed.], [in press] 2021, str.14, doi: 10.1111/1751-7915.13907. [COBISS.SI-ID 73046275]
2. SIRŠE, Mateja, FOKTER, Samo K., ŠTRUKELJ, Borut, ZUPAN, Janja. Silver fir (Abies alba L.) polyphenolic extract shows beneficial influence on chondrogenesis in vitro under normal and inflammatory conditions. Molecules, ISSN 1420-3049, 2020, vol. 25, issue 20, str. 1-14, ilustr. https://doi.org/10.3390/molecules25204616, https://www.mdpi.com/1420-3049/25/20/4616, doi: 10.3390/molecules25204616. [COBISS.SI-ID 32142339]
3. PLAVEC, Tina Vida, ŠTRUKELJ, Borut, BERLEC, Aleš. Screening for new surface anchoring domains for Lactococcus lactis. Frontiers in microbiology, ISSN 1664-302X, 2019, vol. 10, str. 1879-1-1879-13, doi: 10.3389/fmicb.2019.01879. [COBISS.SI-ID 32563239]
4. LUNDER, Mojca, ROŠKAR, Irena, HOŠEK, Jan, ŠTRUKELJ, Borut. Silver fir (Abies alba) extracts inhibit enzymes involved in blood glucose management and protect against oxidative stress in high glucose environment. Plant foods for human nutrition, ISSN 0921-9668, 2019, vol. 74, iss. 1, str. 47-53, ilustr. https://link.springer.com/article/10.1007/s11130-018-0698-6, doi: 10.1007/s11130-018-0698-6. [COBISS.SI-ID 4626801]
5. ŠKRLEC, Katja, RUČMAN, Rudolf, JARC JOVIČIĆ, Eva, SIKIRIĆ, Predrag, ŠVAJGER, Urban, PETAN, Toni, PERIŠIĆ, Milica, ŠTRUKELJ, Borut, BERLEC, Aleš. Engineering recombinant Lactococcus lactis as a delivery vehicle for BPC-157 peptide with antioxidant activities. Applied microbiology and biotechnology, ISSN 0175-7598, 2018, vol. 102, no. 23, str. 10103-10117, doi: 10.1007/s00253-018-9333-6. [COBISS.SI-ID 31660583]
6. BERLEC, Aleš, ŠKRLEC, Katja, SLUGA, Janja, OLENIC, Maria, ŠTRUKELJ, Borut. Single plasmid systems for inducible dual protein expression and for CRISPR-Cas9/CRISPRi gene regulation in lactic acid bacterium Lactococcus lactis. Scientific reports, ISSN 2045-2322, 2018, vol. 8, str. 1-11, ilustr., doi: 10.1038/s41598-018-19402-1. [COBISS.SI-ID 31103271]

Samo Kreft:

1. FATUR, Karsten, KREFT, Samo. Nixing the nightshades = traditional knowledge of intoxicating members of the Solanaceae among hallucinogenic plant and mushroom users in Slovenia. *PloS one*. 2021, vol. 16, no. 2, str. 1-15, ilustr. ISSN 1932-6203
2. TRŠINAR, Bojan, KREFT, Samo. Effect of saw palmetto extract on erectile dysfunction and libido in patients with lower urinary tract symptoms because of benign prostatic obstruction. *Journal of applied research on medicinal and aromatic plants*. 2019, vol. 2, iss. 1, str. 1-6, ilustr. ISSN 2214-7861.
3. STOJILKOVSKI, Katja, URANIČ AHAČIČ, Nataša, KOLAR, Darja, KREFT, Samo. Simple method for the determination of polysaccharides in herbal syrup. *Journal of carbohydrate chemistry*. 2019, vol. 37, iss. 7-8, str.431-441, ilustr. ISSN 1532-2327.
4. KOLEV, Emil, MIRCHEVA, Lilyana, EDWARDS, Michael R., JOHNSTON, Sebastian L., KALINOV, Krassimir, STANGE, Rainer, GANCITANO, Giuseppe, VANDEN BERGHE, Wim, KREFT, Samo. Echinacea purpurea for the long-term prevention of viral respiratory tract infections during covid-19 pandemic : a randomized, open, controlled, exploratory clinical study. *Frontiers in pharmacology*. 2022, vol. 13, str. 1-9. ISSN 1663-9812
5. FATUR, Karsten, RAVNIKAR, Matjaž, FRAS, Vitjan, KREFT, Samo. Pipes and potions : testing the efficacy of European folk preparation methods for anticholinergic Solanaceae plants. *Plants*. 2022, vol. 11, iss. 1, str. 1-12, ilustr. ISSN 2223-7747.
6. SCHOSS, Katja, BENEDETIČ, Rebeka, KREFT, Samo. The phenolic content, antioxidative properties and extractable substances in Silver fir (Abies alba Mill.) branches decrease with distance from the trunk. *Plants*. 2022, vol. 11, no. 3, str. 1-9, ilustr. ISSN 2223-7747.

NASLEDNJE GENERACIJE MOLEKULSKIH MARKERJEV

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Naslednje generacije molekulskih markerjev
Course title:	Next generation of molecular markers
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037291
Koda učne enote na članici/UL Member course code:	3793

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
12	16	0	0	12	85	5

Nosilec predmeta/Lecturer:	Nataša Štajner

Izvajalci predavanj:	Jernej Jakše, Nataša Štajner
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

Jeziki/Languages:	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij.	General conditions for enrollment in doctoral studies.

Vsebina:	Content (Syllabus outline):
Genetski molekularni markerji so dedni polimorfizmi, ki so povezani s spremembami v DNA zaporedju in jih lahko odkrijemo in določimo v eni ali več populacijah preiskovanih organizmov. So nedvoumno izborno orodje moderne genetike in omogočajo študije pomembnih vprašanj populacijske genetike, ekološke genetike in evolucije. Tehnologije naslednjih generacij določevanja nukleotidnih zaporedij (NGS) povzročajo revolucionarne	Genetic molecular markers are heritable polymorphisms that are related to changes in DNA sequence and can be detected and measured in one or more populations of individuals. They are the tools of choice of modern genetics and enable the study of important questions in population genetics, ecological genetics, and evolution. Next generation sequencing (NGS) is about to revolutionize genetic analysis. Currently NGS techniques are mainly used to

spremembe v genetskih analizah. Trenutno se večina NGS pristopov uporablja za sekvenciranje individualnih genomov, vendar se zaradi znatne globine sekvenciranja podatki lahko aplicirajo tudi na področju molekulskih markerjev. Posebno so atraktivni za uporabo npr. v populacijskih analizah nemodelnih organizmov. Pri predmetu bomo študentom predstavili naslednje vsebine: a) Kratke osnove trenutno uporabnih NGS prisopov in vpliv NGS na tehnologije genetskih markerjev (primerjave s tradicionalnimi molekulskimi markerji). b) Odkrivanje NGS molekularnih markerjev in trenutne genotipizacijske metode (sekvenciranje zmanjšanega vzorca kot sta metodi knjižnice zmanjšanih vzorcev – RRL in zmanjšaje kompleksnosti polimorfnih zaporedij – CroPS; RAD-seq oz. z restrikcijskimi mesti povezani DNA markerji; genotipiozacija z nizko pokritostjo, ki vključuje genotipizacijo s sekvenciranjem (GBS) in hkratno hitro genotipizacijo (MSG)). c) Načrtovanje eksperimentov pridobivanja markerjev naslednjih generacij (cilji, dostopnost referenčnega genoma, pričakovan nivo polimorfizma, izbira restrikcijskih encimov, adapterji, PCR pomnoževanje, združevanje osebkov ali hkratna analiza, izzivi). d) Izzivi analize podatkov (pristopi, programska oprema) e) Nadaljni razvoj področja. f) Izbrani literaturni primeri uporabe.	sequence individual genomes, but due to the high sequence coverage these data can be applied in the field of molecular markers as well. They are especially attractive for use in e.g. population analysis of non-model organisms. The following topics will be included: a) short overview of currently used NGS methods and their impact on genetic marker technology (comparison with tradicional molecular markers) b) NGS molecular marker discovery and current genotyping methods (reduced representation sequencing, including reduced-representation libraries (RRLs) and complexity reduction of polymorphic sequences (CRoPS); Restriction site associated DNA markers or RAD-seq; and low coverage genotyping, including multiplexed shotgun genotyping (MSG) and genotyping by sequencing (GBS)). c) Design of next generation marker discovery experiments (goals, availability of reference genome, expected degree of polymorphisms, choice of restriction enzymes, adapters, PCR amplification, sequencing, polling of individuals or multiplexing, challenges). d) Data analysis challenges (methods, availability of program packages) e) Future directions of the field. f) Selected literature examples of the use.

Temeljna literatura in viri/Readings:

1) Genotyping by sequencing for crop improvement (1st ed., str. XX, 379). (2022). J. Wiley & Sons. https://plus.cobiss.net/cobiss/si/sl/bib/ul/147022851 2) Relevantni članki (Relevant articles)

Cilji in kompetence:	**Objectives and competences:**
Osnovni izobraževalni cilj predmeta je predstaviti študentom metode in pristope, ki se uporabljajo na področju naslednjih generacij molekulskih markerjev s poudarkom na nemodelnih organizmih.	The main educational aim of the course is to present methods and research activities, which are used in the field of next generation molecular markers with emphasis on non-model species.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Študent osvoji trenutna znanja, ki se tičejo razvoja in uporabe molekulskih markerjev, ki temeljijo na NGS pristopih. Osvojene vsebine so dobra osnova za reševanje raziskovalnih problemov iz različnih področij uporabe molekulskih markerjev.	Knowledge and understanding: Acquisitions of knowledge related to design and use of molecular markers based on NGS use. Students will get knowledge and competences which will allow them to solve research problems in the field of molecular markers.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Učenje se izvaja v obliki predavanj, v obliki seminarja in s konzultacijami.	Lectures, seminar and consultations.

Načini ocenjevanja:	Delež/Weight	Assessment:
1) Ustno preverjanje znanja.	50,00 %	1) Oral exam.
2) Seminar in njegova predstavitev.	50,00 %	2) Seminar and its demonstration.

Ocenjevalna lestvica:	Grading system:
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Štajner Nataša

1. KUNEJ, Urban, DERVISHI, Aida, LAUCOU, Valérie, JAKŠE, Jernej, ŠTAJNER, Nataša. The potential of HTS approaches for accurate genotyping in grapevine (Vitis vinifera L.). *Genes*. 2020, vol. 11, no. 8 (917), str. 1-16. ISSN 2073-4425. https://www.mdpi.com/2073-4425/11/8/917, DOI: 10.3390/genes11080917. [COBISS.SI-ID 24967939], [JCR, SNIP, WoS do 26. 10. 2022: št. citatov (TC): 1, čistih citatov (CI): 1, čistih citatov na avtorja (CIAu): 0,20, Scopus do 5. 3. 2022: št. citatov (TC): 1, čistih citatov (CI): 1, čistih citatov na avtorja (CIAu): 0,20]

2. DERVISHI, Aida, JAKŠE, Jernej, ISMAILI, Hairi, JAVORNIK, Branka, ŠTAJNER, Nataša. Genetic structure and core collection of olive germplasm from Albania revealed by microsatellite markers. *Genes*. 2021, vol. 12, no. 2 (256), str. 1-18. ISSN 2073-4425. https://doi.org/10.3390/genes12020256, DOI: 10.3390/genes12020256. [COBISS.SI-ID 58606851], [JCR, SNIP, WoS do 14. 1. 2023: št. citatov (TC): 8, čistih citatov (CI): 8, čistih citatov na avtorja (CIAu): 1,60, Scopus do 30. 11. 2022: št. citatov (TC): 7, čistih citatov (CI): 7, čistih citatov na avtorja (CIAu): 1,40]

3. MILIŠIĆ, Kristina, SIVČEV, Branislava, ŠTAJNER, Nataša, JAKŠE, Jernej, MATIJAŠEVIĆ, Saša, NIKOLIĆ, Dragan, POPOVIĆ, Tatjana, RANKOVIĆ-VASIĆ, Zorica. Ampelographic and molecular characterisation of grapevine varieties in the gene bank of the experimental vineyard 'Radmilovac' – Serbia. *OENO One*. 2021, vol. 55, no. 4, str. 129-144, ilustr. ISSN 2494-1271. https://oeno-one.eu/article/view/4508, DOI: 10.20870/oeno-one.2021.55.4.4508. [COBISS.SI-ID 89367555], [JCR, SNIP, WoS do 18. 11. 2022: št. citatov (TC): 1, čistih citatov (CI): 1, čistih citatov na avtorja (CIAu): 0,13, Scopus]

4. BITZ, Lidija, MALIDŽAN, Slavojka, ŠTAJNER, Nataša, TENHOLA-ROININEN, Teija, JAVORNIK, Branka. Identification of citruses from Montenegro based on microsatellite clustering analyses. *Der Erwerbs-Obstbau : Berichte aus Wissenschaft und Praxis*. [Print ed.]. 2020, vol. 62, iss. 3, str. 347-354. ISSN 0014-0309. DOI: 10.1007/s10341-020-00508-8. [COBISS.SI-ID 19745539], [JCR, SNIP, WoS, Scopus]

5. FLAJŠMAN, Marko, ŠTAJNER, Nataša, KOCJAN AČKO, Darja. Genetic diversity and agronomic performance of Slovenian landraces of proso millet (Panicum miliaceum L.). *Turkish journal of botany*. Tiskana izd. 2019, vol. 43, no.2, str. 185-195. ISSN 1300-008X. DOI: 10.3906/bot-1807-83. [COBISS.SI-ID 9180025], [JCR, SNIP, WoS do 26. 10. 2022: št. citatov (TC): 2, čistih citatov (CI): 1, čistih citatov na avtorja (CIAu): 0,33, Scopus do 19. 3. 2021: št. citatov (TC): 4, čistih citatov (CI): 3, čistih citatov na avtorja (CIAu): 1,00]

6. DERVISHI, Aida, JAKŠE, Jernej, ISMAILI, Hairi, JAVORNIK, Branka, ŠTAJNER, Nataša. Comparative assessment of genetic diversity in Albanian olive (Olea europaea L.) using SSRs from anonymous and transcribed genomic regions. *Tree genetics & genomes*. 2018, vol. 14, iss. 4 (53), str. 1-13. ISSN 1614-2942. DOI: 10.1007/s11295-018-1269-6. [COBISS.SI-ID 8997753], [JCR, SNIP, WoS do 26. 10. 2022: št. citatov (TC): 12, čistih citatov (CI): 11, čistih citatov na avtorja (CIAu): 2,20, Scopus do 6. 5. 2022: št. citatov (TC): 12, čistih citatov (CI): 11, čistih citatov na avtorja (CIAu): 2,20]

Jernej Jakše

1. KRIŽMAN, Mitja, JAKŠE, Jernej. Chemical and genetic variability of Istrian foeniculum vulgare wild populations. Plants. 2022, vol. 11, iss. 17, str. 1-12, ilustr. ISSN 2223-7747. https://www.mdpi.com/2223-7747/11/17/2239, DOI: 10.3390/plants11172239. [COBISS.SI-ID 121096963]

2. ADAKALIĆ, Mirjana, LAZOVIĆ, Biljana, BARUCA ARBEITER, Alenka, HLADNIK, Matjaž, JAKŠE, Jernej, BANDELJ, Dunja. Morphological and microsatellite analysis of the ancient Montenegrin olive variety 'Žutica' revealed different clones. Acta agriculturae Slovenica. [Tiskana izd.]. 2020, letn. 116, št. 2, str. 205-216. ISSN 1581-9175. http://ojs.aas.bf.uni-lj.si/index.php/AAS/article/view/1774, DOI: 10.14720/aas.2020.116.2.1774. [COBISS.SI-ID 44495875]

3. WEBER, Tim, JAKŠE, Jernej, SLADONJA, Barbara, HRUŠEVAR, Dario, LANDEKA, Nediljko, BRANA, Slavko, BOHANEC, Borut, MILOVIĆ, Milenko, VLADOVIĆ, Dalibor, MITIĆ, Božena, POLJUHA, Danijela. Molecular study of selected taxonomically critical taxa of the genus Iris L. from the

broader Alpine-Dinaric area. Plants. 2020, vol. 9, no. 9, 1229, str. 1-16. ISSN 2223-7747. https://www.mdpi.com/2223-7747/9/9/1229, DOI: 10.3390/plants9091229. [COBISS.SI-ID 29832451]
4. ČERENAK, Andreja, KOLENC, Zala, SEHUR, Petra, WHITTOCK, Simon P., KOUTOULIS, Anthony, BEATSON, Ron, BUCK, Emily J., JAVORNIK, Branka, ŠKOF, Suzana, JAKŠE, Jernej. New male specific markers for hop and application in breeding program. Scientific reports. 2019, vol. 9, str. 1-9 (14223), ilustr. ISSN 2045-2322. https://doi.org/10.1038/s41598-019-50400-z, DOI: 10.1038/s41598-019-50400-z. [COBISS.SI-ID 9313913]
5. HLADNIK, Matjaž, JAKŠE, Jernej, KHADARI, B., SANTONI, S., BANDELJ, Dunja. Interlaboratory comparison of fig (Ficus carica L.) microsatellite genotyping data and determination of reference alleles. Acta agriculturae Slovenica. [Tiskana izd.]. 2018, letn. 111, št. 1, str. 143-159, ilustr., graf. prikazi. ISSN 1581-9175. DOI: 10.14720/aas.2018.111.1.14. [COBISS.SI-ID 1540260548]
6. BARUCA ARBEITER, Alenka, HLADNIK, Matjaž, JAKŠE, Jernej, BANDELJ, Dunja. Identification and validation of novel EST-SSR markers in olives. Scientia Agrícola. May/June 2017, v. 74, n. 3, str. 215-225, ilustr. ISSN 1678-992X. DOI: 10.1590/1678-992X-2016-0111. [COBISS.SI-ID 8685945]

OCENJEVANJE DOBROBITI ŽIVALI

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Ocenjevanje dobrobiti živali
Course title:	Assessment of animal welfare
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037351
Koda učne enote na članici/UL Member course code:	3854

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	20	0	0	0	95	5

Nosilec predmeta/Lecturer:	Dušanka Jordan

Izvajalci predavanj:	Dušanka Jordan
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

Jeziki/Languages:	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij.	General conditions for enrolment in doctoral studies.

Vsebina:	Content (Syllabus outline):
Glavne teme, ki bodo obdelane v okviru predmeta: - obnašanje živali (sprejemanje, prenos in analiza dražljajev iz okolja, fiziološki parametri obnašanja, etogram - za vrsto značilno obnašanje…) - potrebe živali in najpogostejši dejavniki, ki onemogočajo zadovoljevanje potreb živali - posledice nezmožnosti zadovoljevanja potreb in prilagoditve živali na dražljaje iz okolja (spremembe v za vrsto značilnem obnašanju, pojav anomalij v	Major themes discussed within the course: - animal behaviour (detecting, transferring and analysing stimuli from the external environment, physiological parameters of behaviour, ethogram – species-specific behaviour…) - animal needs and the most frequent factors disabling animals to satisfy their needs - consequences for animals not being able to satisfy their needs and to cope with external environment

obnašanju, fiziologija stresa, akutni in kronični stres…) - pomen in definicije dobrobiti živali - parametri in metode za ocenjevanje dobrobiti živali (preferenčni testi, motivacijski testi, protokoli za ocenjevanje dobrobiti, spremljanje pojava anomalij v obnašanju, čustvenih stanj, fizioloških parametrov, obolevnosti, smrtnosti, proizvodnih parametrov…), njihove značilnosti, prednosti in slabosti - najbolj pogosti problemi vezani na dobrobit živali in možne rešitve.	stimuli (changes in species-specific behaviour, appearance of abnormal behaviours, stress physiology, chronic and acute stress…) - importance and definitions of animal welfare - parameters and methods to assess animal welfare (preference tests, motivational tests, animal welfare assessment protocols, recording of abnormal behaviours, affective states, physiological parameters, mortality, morbidity, production parameters…), their characteristics, advantages and disadvantages - the most common problems related to animal welfare and possible solutions.

Temeljna literatura in viri/Readings:

- Fraser D. 2008. Understanding animal welfare: the science in its cultural context. Oxford,
- Wiley-Blackwell: 336 str., ISBN 978-1-4051-3695-2
- Ekesbo I. (ur) 2011. Farm animal behaviour: characteristics for assessment of health and welfare. Wallingford, CAB International: 237 str., ISBN 978-1-84593-770-6
- Blokhuis H.J., Miele M., Veissier I., Jones B (ur.) 2013. Improving farm animal welfare: science and society working together: the Welfare Quality approach. Wageningen, Wageningen Academic Publishers: 232 str, ISBN 978-90-8686-216-0
- Grandin T. (ur.) 2010. Improving animal welfare: a practical approach. Wallingford, CAB International: 328 str., ISBN 978-1-84593-541-2
- Aland A., Banhazi T. (ur.) 2013. Livestock housing: modern management to ensure optimal health and welfare of farm animals. Wageningen, Wageningen Academic Publishers: 491 str., ISBN 978-90-8686-217-7
- Broom D. M., Fraser A. F. (ur.) 2015. Domestic animal behaviour and welfare. Wallingford, Boston, CABI: 462 str.
- revijalni članki s področja, tekoča periodika, druga učna gradiva…

Cilji in kompetence:	**Objectives and competences:**
Študent bo pridobil znanje potrebno za razumevanje: - vzrokov in posledic v kolikor okolje živali ne omogoča zadovoljevanje njihovih potreb - primernosti posameznih parametrov in metod ocenjevanja dobrobiti živali - najpogostejše probleme vezane na dobrobit živali, ki so v oskrbi človeka (rejne, družne, laboratorijske živali, živali v različnih zavodih…) in možne rešitve	The student will gain knowledge necessary for understanding of: - causes and consequences if animals are not able to satisfy their needs - suitability of individual parameters and methods for assessing animal welfare the most common problems related to animal welfare in animals under the care of people (farm, companion, laboratory animals, animals in institutions…) and possible solutions

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Na podlagi pridobljenega znanja bo študent usposobljen za: - prepoznavanje možnih problemov z vidika doborbiti živali v oskrbi človeka - kritično ovrednotenje dobrega počutja živali iskanje in podajanje možnih znanstveno utemeljenih praktičnih rešitev za izboljšanje dobrobiti živali	Knowledge and understanding: On the basis of gained knowledge the student will be qualified to: - identify possible animal welfare issues in animals under the care of people - critically assess animal welfare search for and identify possible scientifically-based practical solutions for improvement of animal welfare

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja konzultacije Seminarska ali projektna naloga	Lectures Consultations Seminar or project work

Načini ocenjevanja:	Delež/Weight	Assessment:
Seminarska ali projektna naloga	80,00 %	Seminar or project work
Pisni ali ustni izpit	20,00 %	Written or oral exam

Ocenjevalna lestvica:	Grading system:
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Dušanka Jordan

1. LIERE, Diederik van, DWYER, Cathy M**., JORDAN, Dušanka**, PREMIK BANIČ, Andrea, VALENČIČ, Aleš, KOMPAN, Drago, SIARD, Nataša. Farm characteristics in Slovene wolf habitat related to attacks on sheep. Applied animal behaviour science. 2013, vol. 144, no. 1/2, str. 46-56. ISSN 0168-1591.
2. **JORDAN, Dušanka**, GORJANC, Gregor, ŠTUHEC, Ivan, ŽGUR, Silvester. Improvement of pork characteristics under commercial conditions with small amount of straw or hay. Journal of applied animal research. 2018, vol. 46, no. 1, str. 1317-1322. ISSN 0971-2119.
3. LESKOVEC, Jakob, LEVART, Alenka, ŽGUR, Silvester, **JORDAN, Dušanka**, PIRMAN, Tatjana, SALOBIR, Janez, REZAR, Vida. 2018. Effects of olive leaf and marigold extracts on the utilization of nutrients and on bone mineralization using two different oil sources in broilers. Journal of poultry science. 2018, vol. 55, no. 1, str. 17-27. ISSN 1346-7395.
4. SIARD, Nataša, **JORDAN, Dušanka**. Slovenian students' knowledge and opinions about wild boar (Sus scrofa L.). Anthrozoös : a multidisciplinary journal of the interactions of people and animals. 2018, vol. 31, no. 6, str. 741-760, ISSN 0892-7936.
5. ZUPAN, Manja, ŠTUHEC, Ivan, **JORDAN, Dušanka**. The effect of an irregular feeding schedule on equine behavior. Journal of applied animal welfare science. 2020, vol. 23, no. 2, str. 156-163, ISSN 1088-8705.
6. TERČIČ, Dušan, PANČUR, Mojca, **JORDAN, Dušanka**, ZUPAN, Manja. Effects of dimethyl anthranilate-based repellents on behavior, plumage condition, egg quality, and performance in laying hens. Frontiers in veterinary science. 2020, vol 7, art. no. 533, str. 1-13, ISSN 2297-1769

OCENJEVANJE TVEGANJA IN UPRAVLJANJE S FITOFARMACEVTSKIMI SREDSTVI V OKOLJU

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Ocenjevanje tveganja in upravljanje s fitofarmacevtskimi sredstvi v okolju
Course title:	Pesticide risk assessment and management
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037251
Koda učne enote na članici/UL Member course code:	3753

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	5	15	0	5	90	5

Nosilec predmeta/Lecturer:	Marjetka Suhadolc

Izvajalci predavanj:	Marjetka Suhadolc
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

Jeziki/Languages:	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Diplomanti enovitih magistrskih študijskih programov in študijskih programov 2. stopnje s področja biomedicinskih, biotehniških in naravoslovno matematičnih usmeritev.	Graduates of uniform master programmes and 2nd cycle programmes of biomedical, biotechnical, mathematical and natural science

Vsebina:	**Content (Syllabus outline):**
Fitofarmacevtska sredstva – osnovne definicije. Procesi v usodi fitofarmacevtskih sredstev in dejavniki, ki jo določajo. Porazdelitev v tleh, mehanizmi vezave, fenomen vezanih ostankov, izhlapevanje, zanašanje, površinski odtok,	Pesticides - basic definitions. Processes in the fate of plant protection products and the influental factors. Distribution in the soil, binding mechanisms, the phenomenon of bound residues, evaporation, drift, surface runoff, movement in soil profile, leaching

premeščanje v talnem profilu, izpiranje v podtalnico, sprejem v organizme, transformacije - razgradnja – mineralizacija. Remediacija tal: biostimulacija in bioaugumentacija. Vpliv FFS na neciljne organizme. Predstavitev metod preučevanja usode organskih ksenobiotikov v okolju na različnih nivojih in vrednotenja njihovih rezultatov. Uporaba dinamičnega modeliranja in metamodeliranje za ocenjevanje tveganj in upravljanje s FFS v okolju. Karte ranljivosti tal. Omilitveni ukrepi za preprečevanje točkovnega in razpršenega onesnaženja s FFS. FFS na podlagi mikroorganizmov in virusov – prednosti, omejitve in možnosti uporabe v integriranem varstvu rastlin. Zakonodaja, ki obravnava okoljska tveganja FFS v R Sloveniji in EU.	into groundwater, uptake by organisms, transformation - degradation - mineralization. Soil remediation: biostimilation and bioaugumentation. The impact of pesticides on non-target organisms. Methods for examining the fate of pesticide in the environment at different levels will be presented, as well as how to interpretate their results. Dynamic modeling and metamodeling approaches for pesticide risk assessment and management in the environment. Maps of soil vulnerability. Mitigation measures for the prevention of point and diffuse pollution by pesticides. Pesticides on the basis of micro-organisms and viruses (biopesticides) - the advantages, limitations and possible applications in integrated plant protection. Legislation dealing with environmental risks of pesticides in Slovenia and EU.

Temeljna literatura in viri/Readings:

Znanstveni članki /Scientific papers
Priporočena literatura
Dunnivant F.M. in Anders E., 2006. A basic introduction to pollutant fate and transfort. An integrated approach with chemistry, modelling, risk assessment and environmental legislation. John Wiley & Sons, Inc. New Jersey, 480 s.
Roberts T., Hutson D., 1999. Metabolic pathways of agrocemicals (part 1 and 2), The Royal Society of Chemisty, MPG Books Ltd., Cornwall, 1475/ 849 s.
Suhadolc M., 2018. Uporaba prostorskih podatkov za upravljanje fitofarmacevtskih sredstev na ravni povodja. Geodetski vestnik. 2018, letn. 62, št. 1, str. 39-50.

Cilji in kompetence:	**Objectives and competences:**
Posredovati znanja za razumevanje usode fitofarmacevtskih sredstev (FFS) v okolju. Študente seznaniti z različnimi pristopi za ugotavljanje tveganja uporabe FFS in upravljanje s FFS v okolju. Študente spodbujati k samostojnemu razmišljanju o ukrepih za zmanjševanje okoljskih tveganj uporabe FFS. Specifičnosti FFS na podlagi mikroorganizmov in virusov ter možnosti souporabe s kemičnimi FFS.	Provide knowledge on pesticide fate in the environment. Different approaches to pesticide risk assessment and management in the environment will be introduced. Students will be encouraged to independently reflect mitigation measures for reducing environmental risks of pesticides. Specifics of biopesticides and the possibility of the joint use with chemical pesticides.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Kandidat bo sposoben samostojno vrednotiti podatke o lastnostih FFS, ki določajo njihovo usodo v okolju. Sposoben bo izdelati ocene tveganj uporabe FFS v različnih kmetijsko-okoljskih scenarijih in predlagati možne ukrepe za zmanjševanje teh tveganj na ravni kmetije, kot tudi vodozbirnih območij in državni ravni.	Knowledge and understanding: Students will be able to independently evaluate pesticide properties data which determine their environmental fate. Moreover, they will be able to make pesticide risk assessments in different agro-environmentač scenarios and propose possible measures to mitigate those risks at farm scale, as well as on the catchment and national level.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predmet se izvaja v obliki predavanj, seminarskih vaj (delo z modeli) in samostojne seminarske naloge, kjer pridobljena znanja uporabijo. Uporabljena bodo sodobna audiovizualna sredstva in računalniška orodja (modeli FOCUS, FOOTPRINT orodja, arcGIS).	The course will consist of lectures, tutorials (working with models) and a separate seminar, where acquired knowledge is used.Modern audio-visual products and computer tools will be applied (models FOCUS FOOTPRINT tools, ArcGIS).

Načini ocenjevanja:	Delež/Weight	Assessment:
Seminar.	50,00 %	Seminar.
Ustni izpit.	50,00 %	Oral examination.

Ocenjevalna lestvica:	Grading system:
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Marjetka Suhadolc

NGUYEN, Nghia Khoi, DÖRFLER, Ulrike, WELZL, Gerhard, MUNCH, Jean Charles, SCHROLL, Reiner, SUHADOLC, Marjetka. Large variation in glyphosate mineralization in 21 different agricultural soils explained by soil properties. Science of the total environment. 2018, vol. 627, str. 544-552. ISSN 0048-9697. [COBISS.SI-ID 8929145], https://doi.org/10.1016/j.scitotenv.2018.01.204

SUHADOLC, Marjetka. Uporaba prostorskih podatkov za upravljanje fitofarmacevtskih sredstev na ravni povodja = Spatial data application for pesticide management at the catchment scale. Geodetski vestnik : glasilo Zveze geodetov Slovenije. [Tiskana izd.]. 2018, letn. 62, št. 1, str. 39-50, ilustr. ISSN 0351-0271. http://www.geodetski-vestnik.com/62/1/gv62-1_suhadolc.pdf, DOI: 10.15292/geodetski-vestnik.2018.01.39-50. [COBISS.SI-ID 8400737]

KAURIN, Anela, MIHELIČ, Rok, KASTELEC, Damijana, GRČMAN, Helena, BRU, David, PHILIPPOT, Laurent, SUHADOLC, Marjetka. Resilience of bacteria, archaea, fungi and N-cycling microbial guilds under plough and conservation tillage, to agricultural drought. Soil biology & biochemistry. [Print ed.]. 2018, vol. 120, str. 233-245. ISSN 0038-0717. [COBISS.SI-ID 8956537]

PINTARIČ, Sara, SUHADOLC, Marjetka, ELER, Klemen. Straw management and slurry application affect the soil microbial community composition and its activity. Agronomy. 2022, vol. 12, iss. 11, art. 2781, 19 str., ilustr. ISSN 2073-4395. https://www.mdpi.com/2073-4395/12/11/2781, DOI: 10.3390/agronomy12112781. [COBISS.SI-ID 134456067].

MAČEK, Irena, PINTARIČ, Sara, ŠIBANC, Nataša, RAJNIŠ, Tatjana, KASTELEC, Damjana, LEŠTAN, Domen, SUHADOLC, Marjetka. Plants play a crucial role in the development of soil fungal communities in the remediated substrate after EDTA washing of metal-contaminated soils. Frontiers in environmental science. 2022, vol. 10, art. :978850, 11 str. ISSN 2296-665X. COBISS.SI-ID 121915395.

CANIA, Barbara, VESTERGAARD, Gisle, SUHADOLC, Marjetka, MIHELIČ, Rok, KRAUSS, Maike, FLIESSBACH, Andreas, MÄDER, Paul, SZUMEŁDA, Anna, SCHLOTER, Michael, SCHULZ, Stefanie. Site-specific conditions change the response of bacterial producers of soil structure-stabilizing agents such as exopolysaccharides and lipopolysaccharides to tillage intensity. Frontiers in microbiology. 2020, vol. 11, art. no. 568, str. 1-14, ilustr. ISSN 1664-302X. https://doi.org/10.3389/fmicb.2020.00568. COBISS.SI-ID 9459577.

SUHADOLC, Marjetka. Velika variabilnost v razgradnji herbicida glifosata - ali jo lahko pojasnimo z lastnostmi tal?. Vabljeno predavanje. V: TRDAN, Stanislav (ur.). Zbornik predavanj in referatov 14. slovenskega posvetovanja o varstvu rastlin z mednarodno udeležbo, Maribor, 5.-6. marec, Maribor,. Str. 1-8, ilustr. ISBN 978-961-93447-7-4. [COBISS.SI-ID 9407609

ODPORNOST PROTI PROTIMIKROBNIM UČINKOVINAM V OKOLJU

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Odpornost proti protimikrobnim učinkovinam v okolju
Course title:	Resistance to antimicrobial agents in the environment
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code: 0640309

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	10	10	0	10	85	5

Nosilec predmeta/Lecturer:	Karmen Godič Torkar
Izvajalci predavanj:	Jerneja Ambrožič Avguštin, Karmen Godič Torkar, Anja Klančnik, Polonca Trebše
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	
Vrsta predmeta/Course type:	teoretični /theoretical

Jeziki/Languages:	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Diplomanti enovitih magistrskih študijskih programov in študijskih programov 2. stopnje s področja biomedicinskih, biotehniških in naravoslovno matematičnih usmeritev.	Graduates of unified master's degree programs and 2nd degree programs of biomedical, biotechnical and natural sciences.

Vsebina:	Content (Syllabus outline):
1. Pregled spojin, za katere je znano, da vzpodbudijo razvoj odpornosti mikroorganizmov: a. štirje podrazredi: antibiotiki, antimikotiki, protivirusna zdravila in antiparazitiki; b. substance za	1. The overview of chemicals, which are known to stimulate the resistance development a. four subclasses:antibiotics, antifungals, antivirals, and antiparasitics; b. growth promoting substances in food animal production; c. biocides (i.e.,

vzpodbujanje rasti v živinoreji; c. biocidi (npr. razkužila in površinsko aktivne snovi, konzervansi), d. spojine naravnega izvora (npr. iz rastlin), e. ksenobiotične snovi (npr. topila, kot so oktanol, heksan in toluen); f. težke kovine
2. Intrinzični in pridobljeni mehanizmi protimikrobne odpornosti, vertikalni in horizontalni prenosi genov
3. Skupne značilnosti, hkratni ali navzkrižni prenos in povezave med odpornostjo proti različnim snovem in postopkom.
4. Načini širjenja protimikrobnih sredstev in odpornih mikroorganizmov v okolju:
1. vodna okolja, površinske vode, podtalnice,
2. odpadne vode iz zdravstvenih in farmacevtskih ustanov;
3. komunalne in industrijske odpadne vode
4. izplake gnojevke iz živinoreje v okolje in njihova uporaba v poljedelstvu
5. uporaba aktivnega blata iz čistilnih naprav kot gnojilo;
6. ribogojstvo;
7. aerosoli;
8. rastlinska biomasa;
9. živali za proizvodnjo hrane;
10. prst, sediment in kompostiranje

5. Protimikrobne snovi v okolju: fizikalno-kemijske lastnosti (pH, topnost, hidrofobnost, Henrijev koeficient itd.), stabilnost in spremembe v okolju ter delovanje in aktivnost razgradnih produktov.
6. Vpliv ostankov protimikrobnih snovi na organizme v okolju, vključno s človekom in ocena tveganja (akutni in/ali dolgoročni, kronični strupeni učinki na človeka in okolje, skrb vzbujajoče PBT in vPvB snovi)
7. Intrinzična odpornost okoljskih nepatogenih mikroorganizmov proti protimikrobnim snovem v okolju, brez vpliva človeka. Možnosti horizontalnega prenosa genov za odpornost na potencialne humane patogene in obratno.
8. Prenos večkratno odpornih mikroorganizmov v javnih nezdravstvenih ustanovah (npr. socialno varstvene ustanove, šole, vrtci) ter v domačem okolju in njihov vpliv na okužbe, povezane z zdravstvom.
9. Uporaba protimikrobih snovi v živilstvu in njihov vpliv na odpornost patogenih mikroorganizmov, ki se prenašajo alimentarno in kot zoonoze.
10. Pregled metod za ugotavljanje delovanja protimikrobnih snovi in odpornih mikroorganizmov ter iskanje njihovih tarč ali mehanizmov prilagoditve/odpornosti.
11. Celostni nadzor nad uporabo protimikrobnih snovi in drugih biocidov ter pojavom genov za odpornost v humani in veterinarski medicini, v živinoreji, v živilstvu in okolju

disinfectants and surfactants, preservatives, aditives), d. natural chemicals (e.g., plant-derived), e. xenobiotic substances (e.g., solvents such as octanol, hexane and toluene), f. heavy metals;
2. Intrinsic and acquired mechanisms of antimicrobial resistance, vertical and horizontal genes transmissions
3. The common characteristics, simultaneous or cross- transmission and bound resistance to various substances and procedures.
4. The ways of spreading the antimicrobial agents and resistant microorganisms in the environment:
1. aquatic environments, surface water and groundwater,
2. wastewater from healthcare and pharmaceutical facilities,
3. municipal, industrial wastewater
4. animal manure and sewage effluents from farms and its use in agriculture
5. activated sludge from sewage treatment plants used as fertilizer in agriculture;
6. aquaculture;
7. aerosols;
8. plant biomass; plant influent and effluent;
9. animals for food production;
10. soil, sediment and composting process.

5. Antimicrobial substances in the environment: physicochemical properties (pH, solubility, hydrophobicity, Henry's coefficient, etc.), stability and changes in the environment and function and activity of degradation products.
6. Impact of antimicrobial residues on organisms in the environment, including humans, and its risk assessment (acute and /or long-term, chronic toxic effects on humans and the environment, PBT and vPvB substances of concern)
7. Intrinsic resistance of environmental non - pathogenic microorganisms to antimicrobial substances in the environment, without human influence. Possibilities of horizontal gene transfer for resistance to potential human pathogens and vice versa.
8. Transfer of multiple resistant microorganisms in community and public non-health institutions (e.g., social welfare institutions, schools, child care facilities) and their impact on nosocomial infections.
9. Use of antimicrobial substances in foodstuffs and their impact on the resistance of pathogenic microorganisms that are transmitted allimentarily and as zoonoses.
10. The overview of the methods for the detection of antimicrobials and resistant micro-organisms, serch of their targets and mechanisms of adaptation/resistance
11. Integrated control of the use of antimicrobials, other biocides, procedures and the resistance genes

	spreading as well in human and veterinary medicine, livestock, food production and in the environment.

Temeljna literatura in viri/Readings:

Antimicrobial[KG1] resistance and food safety : methods and techniques. Editors Chin-Yi Chen, Xianghe Yan, Charlene R. Jackson. Amsterdam [etc.] : Elsevier/AP, cop. 2015, p. 438.
Hardcover ISBN: 978-0-12-801214-7;. Cobis 4589944[KG2]
Antibiotic Resistance. A One-Health Approach, Editor: Martino, Piera Anna, 2023, MDPI – Multidisciplinary Digital Publishing Institute, Basel, Switzerland; 170 strani. ISBN 3036560327, 9783036560328, 9783036560311, 3036560319, doi: http://dx.doi.org/10.3390/books978-3-0365-6031-1
Charmaine Ng. Antimicrobial Resistance in Environmental Waters. 2019, MDPI, Basel, Switzderland. 190 strani; ISBN: 3-03897-609-1; E-knjiga. Dostopno na: https://openresearchlibrary.org/viewer/fe9aeef7-447d-4427-bb88-0132ecc4aef6 (11.11.2023)[KG3]
Kah Wei Chin, Hui Ling Michelle Tiong, Vijitra Luang-In, Nyuk Ling Ma, An overview of antibiotic and antibiotic resistance, Environmental Advances,,Volume 11, 2023, 100331,
ISSN 2666-7657,dostopno na: https://doi.org/10.1016/j.envadv.2022.100331 (11.11. 2023).
The European Union Summary Report on Antimicrobial Resistance in zoonotic and indicator bacteria from humans, animals and food in 2019/2020. ECDC EJ EFSA Journal, Approved: March, 2022. HOBOKEN, e07209-n/a, ISSN: 1831-4732, doi: 10.2903/j.efsa.2022.7209[KG4] .
Izzie Alderton, Barry R. Palmer, Jack A. Heinemann, Isabelle Pattis, Luise Weaver, Maria J. Gutierrez-Gines, Jacqui Horswell, Louis A. Tremblay. The role of emerging organic contaminants in the development of antimicrobial resistance, Emerging Contaminants, volume 7, 2021, 160-171. dostopno na https://doi.org/10.1016/j.emcon.2021.07.001
Christine C. Nguyen, Cody N. Hugie, Molly L. Kile, Tala Navab-Daneshmand. Association between heavy metals and antibiotic-resistant human pathogens in environmental reservoirs: A review, Front. Environ. Sci. Eng. Volume 13, Issue 3, 2019, 46; dostopno na https://doi.org/10.1007/s11783-019-1129-0
Revijalni članki s področja, tekoča periodika in druga učna gradiva // actual scientific papers in the field, current periodicals, other teaching materials.

Cilji in kompetence:	**Objectives and competences:**
Študent: - pozna zakonitosti in mehanizme odpornosti proti protimikrobnim sredstvom; - je usposobljen za pravilno izbiro ter uporabo različnih metod za spremljanje, vrednotenje in kritično presojanje pojava večkratno odpornih mikroorganizmov v kliničnih in nekliničnih okoljih; - je usposobljen za analizo tveganj širjenja odpornih mikroorganizmov, genov za odpornost in zaviralnih snovi v institucijah z različno dejavnostjo: na področju zdravstva, socialnega varstva, farmacevtske proizvodnje, živilstva, ekologije in trajnostnega razvoja; - zna ustrezno ravnati in pravilno obravnavati protimikrobne snovi, razkužila, biocide, substance s težkimi kovinami, snovi, ki spremenijo površinsko napetost, zlasti z vidika njihove vloge pri onesnaževanju okolja; - zna predvideti možne neželene vplive nekontrolirane uporabe protimikrobnih snovi, biocidov za okolje in zdravje;	The student is: - familiar with the legalities and mechanisms of resistance to antimicrobial agents; - qualified for the proper selection and use of various methods for monitoring, evaluation and critical assessment of the appearance of multiple resistant microorganisms in clinical and non-clinical environments; - qualified to analyze the risks of spreading resistant microorganisms, resistance genes and inhibition residues in institutions with different activities: in the fields of health, social care, pharmaceutical production, food production, ecology and sustainable development; - He can handle and properly deal with antimicrobials, disinfectants, biocides, heavy metal substances, surfactants especially in terms of their role in polluting the environment; - can predict possible adverse effects of uncontrolled use of antimicrobials, biocides for the environment and human health;

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje	Knowledge and Comprehension

Razumevanje vpliva človeka na ekosistem in kompleksnih soodvisnosti ter zakonitosti procesov v okolju (zrak, tla in voda) s stališča širjenja onesnažil in genov za odpornosti. Uporaba Sinteza medicinskih, sanitarnih, inženirskih in zdravstvenih principov in tehnik skupaj z znanjem naravoslovja ter trajnostnega razvoja za reševanje specifičnih problemov. Pridobljena znanja in uporabljene pristope je študent sposoben uporabiti pri samostojnem razvojnem in raziskovalnem delu Refleksija Študent je sposoben samostojno definirati problem, načrtovati vsebino raziskovalnega dela, predvideti metode dela ter postaviti raziskovalne cilje. Prenosljive spretnosti Sinteza teoretičnega znanja različnih bazičnih področij znanosti pri reševanju praktičnih problemov iz prakse. Prenosljive spretnosti Študent je sposoben kritično analizirati in povezovati literaturne podatke, sintetizirati različna znanja, zagovarjati rezultate ter sodelovati v diskusiji.	Understanding the human impact to the environment as well as the complex relationships between processes in the environment (air, soil and water) from the view of spreading pollutants and genes for resistance. Application Synthesis of medical, sanitary, engineering and health principles and techniques together with knowledge on fundamental environmental principles and sustainable development to solve particular problems. The student will be able to use the acquired knowledge and used approaches for independent research and development in this field of Analysis Student is able to define problems, propose the content of a research project, suggest research methods and state its goals Skill-transference Ability The synthesis of theoretical knowledge from different fields of basic science in solving problems from practice.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, diskusijske delavnice predstavljenih seminarjev, demonstracija in laboratorijske vaje.	Lectures, discussion workshops of the presented seminars.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Ustni in/ali pisni izpit;	50,00 %	Written or oral examination;
Priprava in zagovor seminarja;	20,00 %	Preparation of the short project
Vsebinska priprava manjšega projekta	30,00 %	Written seminar and its presentation;

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

KARMEN GODIČ TORKAR

DEÁK, Ágota, JANOVÁK, László (avtor, korespondenčni avtor), TALLÓSY, Szabolcs Péter, **GODIČ TORKAR, Karmen**, ABRAM, Anže, DÉKÁNY, Imre, SEBŐK, Dániel, BOHINC, Klemen (avtor, korespondenčni avtor). Synthesis of self-cleaning and photoreactive spherical layered double oxide/polymer composite thin layers : biofouling and inactivation of bacteria. *Applied clay science*. Oct. 2022, vol. 228, str. 1-12, ilustr. ISSN 0169-1317. DOI: 10.1016/j.clay.2022.106587

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OKSIDATIVNI STRES IN METODE ZA NJEGOVO DETEKCIJO

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Oksidativni stres in metode za njegovo detekcijo
Course title:	Oxidative stress and methods for its detection
Članica nosilka/UL Member:	UL ZF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0164181
Koda učne enote na članici/UL Member course code:	0

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	20	0	0	0	95	5

Nosilec predmeta/Lecturer:	Borut Poljšak

Izvajalci predavanj:	Polona Jamnik, Irina Milisav Ribarič, Borut Poljšak
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

Jeziki/Languages:	Predavanja/Lectures:	Slovenščina
	Vaje/Tutorial:	Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij.	General conditions for enrolment in doctoral studies.

Vsebina:	Content (Syllabus outline):
Oksidativni stres je definiran kot porušenje ravnotežja med tvorbo reaktivnih kisikovih zvrsti (RKZ) in antioksidanti v celici. Posamezni vsebinski sklopi: • Pato-fiziološke spremembe povezane s stanjem oksidativnega stresa • Nastanek reaktivnih kisikovih zvrsti v celicah s poudarkom na singletnem kisiku, superoksidnem	Oxidative stress is defined as the inbalance between the formation of reactive oxygen species (ROS) and antioxidants in the cell. Individual Content Assemblies: • Pato-physiological changes associated with the state of oxidative stress • The formation of reactive oxygen species in cells with emphasis on singlet oxygen, superoxide anion,

anionu, vodikovem peroksidu in hidroksilnem radikalu – endogeni in eksogeni viri • Vloga kovinskih ionov pri nastanku oksidativnega stresa. • Antioksidativni obrambni (endogeni in eksogeni) sistemi Metode za detekcijo RKZ: Elektronska paramagnetna resonanca, Detekcija vodikovega peroksida, Detekcija superoksidnega aniona, Določanje sprememb koncentracije eksogenih antioksidantov kot indikator oksidativnega stresa, Določanje poškodb DNK kot indikator oksidativnega stresa, Določanje oksidativnih poškodb proteinov, Poškodbe membran in lipidna peroksidacija kot indikator oksidativnega stresa	hydrogen peroxide and hydroxyl radical - endogenous and exogenous sources • The role of metal ions in the formation of oxidative stress. • Antioxidant defense (endogenous and exogenous) systems • Methods for ROS detecting: Electronic paramagnetic resonance, Detection of hydrogen peroxide, Detection of superoxide anion, Determination of changes in the concentration of exogenous antioxidants as an indicator of oxidative stress, Determination of DNA damage as an indicator of oxidative stress, Determination of oxidative damage to proteins, Damage of membranes and lipid peroxidation as an indicator of oxidative stress

Temeljna literatura in viri/Readings:

Izbrana poglavja / Selected chapters:
Halliwell B., Gutteridge J.M.C. 2015. Free radicals in biology and medicine. Oxford, Oxford University Press: 944 str.
Originalni znanstveni članki iz tekoče periodike / actual scientific papers.

Cilji in kompetence:	**Objectives and competences:**
Cilji: Študenti bodo spoznali kemijsko zgradbo reaktivnih kisikovih zvrsti (RKZ), njihove pozitivne in negativne učinke na zgradbo in delovanje celic / organizmov. V nadaljevanju bodo spoznali definicijo oksidativnega stresa, endogene in eksogene vire ROS ter antioksidativne obrambne sisteme – endogene in eksogene. Primere oksidativnega stresa bodo spoznali pri različnih organizmih, od prokariontov do različnih evkariontov. V drugem delu bo sledil pregled metod za detekcijo oksidativnega stresa. Študenti bodo izdelali seminar, pri katerem bodo spoznali aktualno problematiko s področja oksidativnega stresa, zmožni bodo uporabljati in kombinirati različne vire informacij. Kompetence: Študenti bodo znali detektirati oksidativni stres v celicah in ovrednotiti njegov vpliv na različnih nivojih organizacije bioloških sistemov.	Aims: Students will learn about the chemical structure of reactive oxygen species (ROS), their positive and negative effects on the structure and function of cells/organisms. This will be followed by learning definition of oxidative stress, internal and external sources of ROS and endogenous and exogenous antioxidant defence systems. Examples of oxidative stress will be introduced in different organisms, from prokaryotes to different eukaryotes. In the last part a review of methods for oxidative stress detection will be presented. Students will prepare a seminar, which will introduced them with the actual problems in the field of oxidative stress. They will be able to use and combine different sources of information. Competences: Students will be able to detect oxidative stress in the cells and evaluate its effect at different levels of biological systems

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Temeljno razumevanje delovanja RKZ in antioksidantov v celicah. Razumevanje principa oksidativnega stresa v bioloških sistemih in posledic oksidativnega stresa za organizem in razvoj bolezni. Poznavanje metod za detekcijo in ovrednotenje oksidativnega stresa v celicah.	Knowledge and understanding: Basic understanding of ROS and antioxidants action in the cells. Understanding the principles of oxidative stress in biological systems and consequences of oxidative stress to the organism and disease development. Knowledge about the methods of oxidative stress detection and its evaluation in the cells.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, seminar, diskusije.	Lectures, seminar, discussions.

Načini ocenjevanja:	Delež/Weight	Assessment:
ustni izpit	70,00 %	Oral exam
seminar	30,00 %	seminar

Ocenjevalna lestvica:	Grading system:
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

Borut Poljšak:

1. ZIMET, Zlatko, BILBAN, Marjan, MARC-MALOVRH, Mateja, KOROŠEC, Peter, POLJŠAK, Borut, OSREDKAR, Joško, ŠILAR, Mira. 8-isoprostane as oxidative stress marker in coal mine workers. *Biomedical and environmental sciences*, ISSN 0895-3988, 2016, vol. 29, no.8, str. 589-593.
2. ZIMET, Zlatko, BILBAN, Marjan, FABJAN, Teja, KUMER, Kristina, POLJŠAK, Borut, OSREDKAR, Joško. Lead exposure and oxidative stress in coal miners. *Biomedical and environmental sciences*, ISSN 0895-3988, 2017, vol. 30, no.11, str. 841-845.
3. POLJŠAK, Borut, FINK, Rok. The protective role of antioxidants in the defence against ROS/RNS-mediated environmental pollution. *Oxidative medicine and cellular longevity*, ISSN 1942-0994. [Spletna izd.], 2014, vol. 2014, doi: 10.1155/2014/671539.
4. GODIĆ, Aleksandar, POLJŠAK, Borut, ADAMIČ, Metka, DAHMANE, Raja. The role of antioxidants in skin cancer prevention and treatment. *Oxidative medicine and cellular longevity*, ISSN 1942-0994. [Spletna izd.], 2014, vol. 2014. http://www.hindawi.com/journals/omcl/2014/860479/, doi: 10.1155/2014/860479.
5. POLJŠAK, Borut. NAMPT-mediated NAD biosynthesis as the internal timing mechanism : in NAD+ World, time is running in its own way. Rejuvenation research, ISSN 1557-8577, 2018, vol. 21, no. 3, str. 210-224.
6. ZIMET, Zlatko, BILBAN, Marjan, OSREDKAR, Joško, POLJŠAK, Borut, FABJAN, Teja, SUHADOLC, Kristina. Three-day environmental exposure may trigger oxidative stress development and provoke adaptive response resulting in altered antioxidant activity: an experimental study. Iranian Journal of Public Health (Accepted for publication).
7. POLJŠAK, Borut, MILISAV, Irina. Oxidized forms of dietary antioxidants : friends or foes?. *Trends in food science & technology*, ISSN 0924-2244. [Print ed.], Oct. 2014, vol. 39, iss. 2, str. 156-166.

Polona Jamnik:

1. TAVČAR BENKOVIĆ, Eva, ŽIGON, Dušan, MIHAJLOVIČ, Vladimir, PETELINC, Tanja, JAMNIK, Polona, KREFT, Samo. Identification, in vitro and in vivo antioxidant activity, and gastrointestinal stability of lignans from silver fir (abies alba) wood extract. *Journal of wood chemistry and technology*, ISSN 0277-3813, 2017, vol. 37, no. 6, str. 467-477.
2. PETELINC, Tanja, MEDVED, Manca, POLAK, Tomaž, JAMNIK, Polona. Caffeic acid esters affect intracellular oxidation and vitality of yeast Saccharomyces cerevisiae cells. *Natural product communications*, ISSN 1934-578X, 2017, vol. 12, no. 11, str. 1773-1776.
3. LARSSON, Karin, ISTENIČ, Katja, WULFF, Tune, JONSDOTTIR, Rosa, KRISTINSSON, Hordur G., FREYSDOTTIR, Jona, UNDELAND, Ingrid, JAMNIK, Polona. Effect of in vitro digested cod liver oil of different quality on oxidative, proteomic and inflammatory responses in the yeast Saccharomyces cerevisiae and human monocyte-derived dendritic cells. *Journal of the science of food and agriculture*, ISSN 0022-5142. [Print ed.], 2015, vol. 95, iss. 15, str. 3096-3106.
4. PETELINC, Tanja, POLAK, Tomaž, JAMNIK, Polona. Insight into the molecular mechanisms of propolis activity using a subcellular proteomic approach. *Journal of agricultural and food chemistry*, ISSN 0021-8561, 2013, vol. 61, str. 11502-11510
5. PETELINC, Tanja, POLAK, Tomaž, DEMŠAR, Lea, JAMNIK, Polona. Fractionation of phenolic compounds extracted from propolis and their activity in the yeast Saccharomyces cerevisiae. *PloS one*, ISSN 1932-6203, 2013, vol. 8, no. 2, str. 1-8.

6. SKRT, Mihaela, JAMNIK, Polona, POKLAR ULRIH, Nataša. Antioxidative activity of methanolic and water extracts from the hyperthermophilic archaeon Aeropyrum pernix K1. Acta chimica slovenica, ISSN 1318-0207. [Tiskana izd.], 2018, vol. 65, str. 172-182,

Irina Milisav:

1. EGEA, Javier, FABREGAT, Isabel, FRAPART, Yves M., GHEZZI, Pietro, GÖRLACH, Agnes, KIETZMANN, Thomas, KUBAICHUK, Kateryna, KNAUS, Ulla G., LOPEZ, Manuela G., MILISAV, Irina, et al. European contribution to the study of ROS : a summary of the findings and prospects for the future from the COST action BM1203 (EU-ROS). *Redox biology*, ISSN 2213-2317, May 2017, vol. 13, str. 94-162.
2. PAJARES, Marta, JIMÉNEZ-MORENO, Natalia, DIAS, Irundika H. K., DEBELEC, Bilge, VUCETIC, Milica, FLADMARK, Kari E., BASAGA, Huveyda, RIBARIČ, Samo, MILISAV, Irina, CUADRADO, Antonio. Redox control of protein degradation. *BioMed research international*, ISSN 2314-6141, Sep. 2015, vol. 6, str. 409-420.
3. MILISAV, Irina, ŠUPUT, Dušan, RIBARIČ, Samo. Unfolded protein response and macroautophagy in Alzheimer's, Parkinson's and prion diseases. *Molecules*, ISSN 1420-3049, Oct. 2015, vol. 20, no. 12, str. 22718-22756.
4. MILISAV, Irina, RIBARIČ, Samo, ŠUPUT, Dušan. Targeting stress responses for regenerative medicine. V: OSLOWSKI, Christine M. (ur.). *Stress Responses : methods and protocols*, (Methods in Molecular Biology, ISSN 1064-3745, 1292). New York [etc.]: Humana Press. 2015, str. 235-243.
5. POLJŠAK, Borut, MILISAV, Irina. NAD+ as the link between oxidative stress, inflammation, caloric restriction, exercise, DNA repair, longevity, and health span. *Rejuvenation research*, ISSN 1557-8577, 2016, vol. 19, no. 5, str. 406-413.
6. POLJŠAK, Borut, ŠUPUT, Dušan, MILISAV, Irina. Achieving the balance between ROS and antioxidants : when to use the synthetic antioxidants. Oxidative medicine and cellular longevity, ISSN 1942-0994. [Spletna izd.], 2013, vol. 2013. http://www.hindawi.com/journals/oximed/2013/956792/, doi: 10.1155/2013/956792.

POLJŠAK, Borut, MILISAV, Irina. Vitamin B3 forms as precursors to NAD+ : are they safe?. Trends in food science & technology, ISSN 0924-2244. [Print ed.], Sept. 2018, vol. 79, str. 198-203.

PODNEBNE SPREMEMBE

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Podnebne spremembe
Course title:	Climate change
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037252
Koda učne enote na članici/UL Member course code:	3754

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	20	0	0	15	80	5

Nosilec predmeta/Lecturer:	Lučka Kajfež Bogataj

Izvajalci predavanj:	Lučka Kajfež Bogataj
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

Jeziki/Languages:	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
splošni pogoji za vpis na doktorski študij	General conditions for enrolment in doctoral studies.

Vsebina:	Content (Syllabus outline):
Klimatski sistem. Opredelitev podnebnih dejavnikov in interakcij med njimi in povratnih zank. Viri paleo klimatskih informacij. Klima različnih geoloških obdobij. Klimatske značilnosti obdobja meteoroloških merjenj. **Vzroki klimatskih sprememb** (ekstraterestrični in terestrični). Človekov hoten in nehoten vpliv na vremenske spremenljivke, kopno, atmosfero, vreme in podnebje. Tanjšanje ozonskega plašča. Emisije	**Cimate system**. Climatic factors and interactions. Climate sensitivity and feedback mechanisms. Paleo data and proxies. History ans evolution of Earth s climate. Direct Observations of Recent Climate Change. Climate fluctuation and variability. **Drivers of Climate Change** (extraterrestrial and terrestrial). Human impact on climate system and climate. Weather modification, greenhouse gas (GHG) emissions. land use change. Ozone layer,

toplogrednih plinov (TGP) in spremembe rabe tal. Ogljikov cikel – viri in ponori CO2. Vpliv kmetijstva na podnebje. **Podnebno modeliranje**. Globalni modeli splošne cirkulacije in metode interpolacije njihovih rezultatov v manjšo prostorsko skalo. Regionalni klimatski modeli. Predpostavke, interdisciplinarni pristopi, koncepti negotovosti. Napoved bodoče klime v različnih časovnih horizontih (100 do 1000 let). Poti do stabilizacije koncentracij TGP. **Posledice klimatskih sprememb**. Modeli vplivov na naravne (gozd, kmetijstvo, biotska raznovrstnost) in družbene sisteme**.** Interakcije z drugimi globalnimi spremembami. **Blaženje podnebnih sprememb**. Vzvodi za zmanjševanje emisij TGP. Mednarodna javnost in podnebne spremembe – konvencije, dogovori **Prilagajanje na podnebne spremembe**. Povezave med blaženjem, prilagajanjem in trajnostnim razvojem. Pojem ranljivosti agroekosistemov in prilagoditvene sposobnosti.	ozone hole. Carbon cycle – sources and sinks of CO2. Agriculture role in climate change. **Climate modeling.** Global Climate models in downscaling methods. Regional Climate models and their evaluation. Projections of Future Changes in climate (100 to 1000 years). Stabilisation pathways of GHG concentrations. Uncertainty concepts: quantitative measures and qualitative statements. **Key Vulnerabilities and the Risk from Climate Change.** Impacts of climate chnege on natural (forest, agriculture, biodiversity) and social systems. **Mitigation of climate change.** Assessment of mitigation technologies and practices, options, potentials and costs. International responses to climate change. **Adaptation to Climate Risks**. Relationships between adaptation and mitigation. Assessment of adaptation practices, options, constraints and capacity. Perspectives on Climate Change and Sustainability

Temeljna literatura in viri/Readings:

IPCC, 2022: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. Cambridge University Press, Cambridge, UK and New York, NY, USA, 3056 pp., doi:10.1017/9781009325844.
https://report.ipcc.ch/ar6/wg2/IPCC_AR6_WGII_FullReport.pdf
Hartmann, D. L.: Global Physical Climatology. Elsevier, 2016, ISBN - 0-12-328531-3; 0-08-091862-X
https://plus.cobiss.net/cobiss/si/sl/bib/ul/156550403
Rakovec, J., Vrhovec, T., Gregorič, G. 1998. Osnove meteorologije za naravoslovce in tehnike, DMFA; Osnove meteorologije za naravoslovce in tehnike, Društvo matematikov, fizikov in astronomov Slovenije, ISBN - 961-212-089-7; COBISS.SI-ID – 79469056
https://plus.cobiss.net/cobiss/si/sl/bib/ul/79469056
Kajfež Bogataj L. 2012. Vroči novi svet. Ljubljana, Cankarjeva založba: 211 str
https://plus.cobiss.net/cobiss/si/sl/bib/ul/264931584

Cilji in kompetence:	**Objectives and competences:**
• Pridobitev poglobljenega znanja o klimatskem sistemu in planetarni klimi na podlagi fizikalnega pristopa. • Modeliranje procesov, ki vplivajo na podnebje in kvantativne metode za oceno vpliva podnebja na vegetacijo.	• Understanding of Earth climate system and physical factors that influence climate. • Knowledge of approaches to model processes that influence the Earth climate, and methods to quantify vegetation-climate interactions.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje Podrobnejši vpogled v fizikalne dejavnike klime, vzroke za klimatske spremembe in njihovo modeliranje. Razumevanje posledic podnebnih sprememb Uporaba: Uporaba fizikalnih zakonov in preprostih klimatskih modelov za razumevanje klimatskih sprememb.	Knowledge and understanding: Deeper understanding of physical factors that influence the Earth climate, anthropocenic causes of climate change and their descriptions in the models. Understanding climate change consequences. Applicability: The use of basic physical laws and simple climate models to understand climate change processes

Refleksija: Povezava interakcije med atmosfero, oceani, površjem, ledom ter človeškim delovanjem s fizikalnimi zakoni.	Reflection: Interactions between atmosphere, oceans, land, cryosphere, biosphere and humans and their description by physical laws.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, vaje, seminar ob uporabi informacij o stanju klimatskega sistema iz različnih virov	Lectures, tutorials, seminars using information on state of the climate from different sources

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Opravljeni seminarji iz vaj	40,00 %	Problem-solving seminars,
predstavitev seminarja, ustni izpit iz teorije	60,00 %	Seminar presentation, theoretical examination

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

KAJFEŽ-BOGATAJ LUČKA

- BERGANT, K., KAJFEŽ-BOGATAJ, Lučka. N-PLS regression as empirical downscaling tool in climate change studies. Theor. appl. climatol., 2005, no. 1-2, vol. 81, p. 11-23
- DOHERTY, S. J., KAJFEŽ-BOGATAJ, Lučka. 2009. Leassons learned from IPCC AR4 : scientific developments needed to understand, predict, and respond to climate change. Bull. Am. Meteorol. Soc., 2009, vol. 90, no. 4: 497-513.
- DOLINAR, M., VIDRIH, B., KAJFEŽ-BOGATAJ, Lučka, MEDVED, S. 2010. Predicted changes in energy demands for heating and cooling due to climate change. Phys. chem. earth, 2010, vol. 35, no. 1-2: 100-106.
- CEGLAR, A., KAJFEŽ-BOGATAJ, Lučka. 2012 Simulation of maize yield in current and changed climatic conditions: addressing modelling uncertainties and the importance of bias correction in climate model simulations. Eur. J. agron. 2012, vol. 37 (1): 83-95.
- DE LUIS, M., ČUFAR, K., SAZ, M. A., LONGARES, L. A., CEGLAR, A., KAJFEŽ-BOGATAJ, Lučka. 2012. Trends in seasonal precipitation and temperature in Slovenia during 1951-2007. Reg. environ. change , doi: 10.1007/s10113-012-0365-7.
- KURNIK, Blaž, KAJFEŽ-BOGATAJ, Lučka, CEGLAR, A.. 2012. Correcting mean and extremes in monthly precipitation from 8 regional climate models over Europe. *Climate of the past*, ISSN 1814-9324, 2012, vol. 8, no. 2: 953-986. [COBISS.SI-ID 7109241]

POSEBNE VSEBINE OKRASNIH RASTLIN

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Posebne vsebine okrasnih rastlin
Course title:	Specific topics in ornamental plants
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037307
Koda učne enote na članici/UL Member course code:	3809

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	20	0	0	15	80	5

Nosilec predmeta/Lecturer:	Gregor Osterc

Izvajalci predavanj:	Gregor Osterc
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

Jeziki/Languages:	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
splošni pogoji za vpis na doktorski študij	General conditions for enrollment in doctoral study

Vsebina:	Content (Syllabus outline):
Predmet je namenjen študentom, ki želijo svoje znanje nadgraditi s poznavanjem rasti in razvoja okrasnih rastlin. Predmet se dotakne osnovnih pojmov o okrasnih rastlinah, kot so življenjsko obdobje, uporabnost okrasnih rastlin, njihova razširjenost v prostoru. Vsebina predmeta razlaga izbrane poudarke pri procesu razvoja adventivnih korenin, študentje se srečajo z izbranimi posebnostmi fotomorfogeneze in fotoperiodizma pri okrasnih	The course is designed for students who wish to upgrade their skills with knowledge on growth and development of ornamental plants. The course includes basic information on ornamental plants, such as their life span, use of ornamental plants and their distribution. Furthermore it accentuates the process of adventitious roots development, photomorphogeneesis and photoperiodism in ornamental plants as well as some physiological

rastlinah ter z nekaterimi fiziološkimi posebnostmi rasti in razvoja pri tej skupini rastlin. Predmet približa študentom tehnološke rešitve pri gojenju okrasnih rastlin v praksi, ki so posledica prej omenjenih, izbranih zakonitosti rasti (kontrola rasti z DIF vrednostmi, metoda hladnih juter - cool morning, vodni stres, uporaba rastnih regulatorjev). Študentje pri predmetu spoznajo tudi načine načrtovanja in izvedbe sajenja okrasnih rastlin v prostor, ki so posledica analiziranih posebnosti rasti in razvoja okrasnih rastlin.	specifics of growth and development of ornamental plants. Technological solutions in the cultivation of ornamental plants are put to practice to better explain the importance of growth control by DIF values, cool morning method, water stress and the use of plant growth regulators. Students also upgrade their knowledge on choosing the plants for specific locations with integrating the analyzed specificities of growth and development of ornamental plants.

Temeljna literatura in viri/Readings:

Horn, W. (1996): Zierpflanzenbau, Parey Verlag Berlin, ISBN 3-8263-3051-X. Kravanja N. 2001. Okrasne trajnice, Biotehniška fakulteta, Oddelek za krajinsko arhitekturo, 37 str., ISBN: 961-90792-1-3.
Osterc, G., in Rusjan, D. (2013): Drevesničasrtvo in trsničarstvo, Založba Kmečki glas, ISBN 978-961-203-403-0.Šiftar, A. in sod. (2011): Mestno drevje. Botanični vrt Univerze v Ljubljani, ISBN 978-961-6822-11-4.
Osterc, G., in Rusjan, D. (2013): Drevesničasrtvo in trsničarstvo, Založba Kmečki glas, ISBN 978-961-203-403-0.
revijalni članki s področja, tekoča periodika, druga učna gradiva

Cilji in kompetence:	**Objectives and competences:**
Cilj predmeta je, da študentje nadgradijo znanje iz fiziologije rasti in razvoja rastlin s posebnostmi pri okrasnih rastlinah.	The aim of the course is to upgrade the basic knowledge of the physiology of growth and development of plants with the specificities of the ornamental plants.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Študent je na osnovi znanj dobljenih pri predmetu sposoben razumevanja specifičnosti rasti in razvoja okrasnih rastlin. Posledično je sposoben tudi vodenja proizvodnje teh rastlin in njihovega umeščanja v prostor.	Knowledge and understanding: Students are able to understand the specificity of the growth and development of ornamental plants based on the knowledge gained in the course. Consequently, the students can manage the production of ornamental plants and develop planting plans which include information on specific plant needs.

Metode poučevanja in učenja:	**Learning and teaching methods:**
predavanja, seminarji	Lectures, seminar work

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
seminarska naloga	100,00 %	Seminar work

Ocenjevalna lestvica:	**Grading system:**
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

1. KUNC, Nina, HUDINA, Metka, OSTERC, Gregor, BAVCON, Jože, RAVNJAK, Blanka, MIKULIČ PETKOVŠEK, Maja. Phenolic compounds of rose hips of some rosa species and their hybrids native grown in the south-west of Slovenia during a two-year period (2020–2021). Foods. 2023, vol. 12, iss. 10, art. 1952, 18 str., ilustr. ISSN 2304-8158. https://www.mdpi.com/2304-8158/12/10/1952 [COBISS.SI-ID 152293123]OSTERC, Gregor, SOLAR, Anita, HUDINA, Metka, VEBERIČ, Robert, MIKULIČ PETKOVŠEK, Maja. Endogenous IAA dynamics in different shoot parts of chestnut hybrid (Castanea crenata × Castanea sativa) cultivars as a driving force of differences in adventitious root formation. *Propagation*

of ornamental plants. [Tiskana izd.]. 2021, vol. 21, no. 4, str. 131-137, ilustr. ISSN 1311-9109. [COBISS.SI-ID 108787203],

2. KUNC, Nina, HUDINA, Metka, MIKULIČ PETKOVŠEK, Maja, OSTERC, Gregor. Breeding of modern rose cultivars decreases the content of important biochemical compounds in rose hips. Plants. 2023, vol. 12, iss. 21, art. 3734, 14 str., ilustr. ISSN 2223-7747. https://doi.org/10.3390/plants12213734, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=152104. [COBISS.SI-ID 170711555]OSTERC, Gregor, MIKULIČ PETKOVŠEK, Maja, ŠTAMPAR, Franci, KIPROVSKI, Biljana, RAVNJAK, Blanka, BAVCON, Jože. Characterization of various color parameters (anthocyanins and flavonols) of leaves and flowers in different autochthonous genotypes of Cyclamen purpurascens. *Journal of the American Society for Horticultural Science*. [Print ed.]. 2018, vol. 143, no. 2, str. 118-129. ISSN 0003-1062. DOI: 10.21273/JASHS04320-17. [COBISS.SI-ID 8947321],

3. RAVNJAK, Blanka, BAVCON, Jože, OSTERC, Gregor. Physiological response of local populations of species *Cyclamen purpurascens* Mill. to forest gaps. *Applied ecology and environmental research : international scientific journal*. 2019, vol. 17, no. 5, str. 11489-11508, ilustr. ISSN 1785-0037. DOI: 10.15666/aeer/1705_1148911508. [COBISS.SI-ID 9325689]

4. VOŠNJAK, Matej, LIKAR, Matevž, OSTERC, Gregor. The effect of mycorrhizal inoculum and phosphorus treatment on growth and flowering of ajania (*Ajania pacifica* (Nakai) Bremer et Humphries) plant. *Horticulturae*. 2021, vol. 7, no. 7 (178), str. 1-13. ISSN 2311-7524. https://www.mdpi.com/2311-7524/7/7/178, DOI: 10.3390/horticulturae7070178. [COBISS.SI-ID 69210883]

5. KUNC, Nina, HUDINA, Metka, MIKULIČ PETKOVŠEK, Maja, BAVCON, Jože, RAVNJAK, Blanka, OSTERC, Gregor. Detailed metabolic characterization of flowers and hips of *Rosa gallica* L. grown in open nature. Plants. 2023, vol. 12, iss. 16, [art.] 2979, 16 str., ilustr. ISSN 2223-7747. https://www.mdpi.com/2223-7747/12/16/2979, https://repozitorij.uni-lj.si/IzpisGradiva.php?id=148796, DOI: 10.3390/plants12162979. [COBISS.SI-ID 162849795]OSTERC, Gregor, RAVNJAK, Blanka, HUDINA, Metka, BAVCON, Jože. Genotype diversity assessment of common snowdrop (Galanthus nivalis L.) based on chlorophyll and carotenoids partitioning among different plant organs. *European journal of horticultural science*. 2021, vol. 86, no. 3, str. 252-259, ilustr. ISSN 1611-4426. DOI: 10.17660/eJHS.2021/86.3.4. [COBISS.SI-ID 64929539]

6. KUNC, Nina, MIKULIČ PETKOVŠEK, Maja, HUDINA, Metka, BAVCON, Jože, VREŠ, Branko, OSTERC, Gregor, RAVNJAK, Blanka. Autochthonous rose hybrid Rosa pendulina X spinosissima overshines main genotype Rosa pendulina in the biochemical characteristics of their hips. *Horticulturae*. 2022, vol. 8, iss. 8, art. 669, 12 str., ilustr. ISSN 2311-7524. https://www.mdpi.com/2311-7524/8/8/669, DOI: 10.3390/horticulturae8080669. [COBISS.SI-ID 120555779]

POVEZAVA SENZORIČNIH IN INSTRUMENTALNIH METOD

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Povezava senzoričnih in instrumentalnih metod
Course title:	Interaction of sensory and instrumental methods
Članica nosilka/UL Member:	UL BF

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Bioznanosti, tretja stopnja, doktorski	Ni členitve (študijski program)		Celoletni	izbirni

Univerzitetna koda predmeta/University course code:	0037367
Koda učne enote na članici/UL Member course code:	3870

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
10	0	0	0	25	90	5

Nosilec predmeta/Lecturer:	Mojca Korošec

Izvajalci predavanj:	Mojca Korošec
Izvajalci seminarjev:	
Izvajalci vaj:	
Izvajalci kliničnih vaj:	
Izvajalci drugih oblik:	
Izvajalci praktičnega usposabljanja:	

Vrsta predmeta/Course type:	teoretični/theoretical

Jeziki/Languages:	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Splošni pogoji za vpis na doktorski študij.	General conditions for enrolment in Doctoral Study.

Vsebina:	Content (Syllabus outline):
Specifična znanja s področja senzorične analize. Sodobne senzorične metode: profiliranje arome, kvantitativna opisna analiza, profiliranje teksture, senzorični spekter, profiliranje po lastni izbiri. Aroma/tuja aroma: receptorji za zaznavanje. Sodobne senzorične in instrumentalne metode (GC/vohanje in HTLC/okušanje, elektronski nos, elektronski jezik) za določanje senzorično aktivnih snovi in za ugotavljanje pristnosti oziroma potvorjenosti živil.	Specific knowledge in the field of sensory analysis. Modern methods of sensory analysis: flavour profiling, quantitative descriptive analysis, texture profiling, sensory spectrum, free choice profiling. Flavour/off flavour: receptors for flavour perception. Modern sensory and instrumental methods (GC/olfactometry and HTLC/gustatory testing, electronic nose, electronic tongue) for determining

Povezave med različnimi parametri kakovosti (instrumentalnimi in senzoričnimi) in oblikovanje podatkovnih baz.	the aroma active components and to identify adulteration and authenticity of food. The interaction of different parameters (instrumental and sensory) and generation of the databases.

Temeljna literatura in viri/Readings:

Izbrana poglavja iz naslednjih publikacij:

- Varela, Paula (ur.), Ares, Gaston (ur.). Methods in consumer research. Volume 2, Alternative approaches and special applications. Duxford : Woodhead Publishing : Elsevier, 2018.
- Leer, Jonatan (ur.), Krogager, Stinne Gunder Strøm (ur.). Research methods in digital food studies. London ; New York : Routledge, Taylor & Francis Group, 2021.
- Kilcast, David (ur.). Instrumental Assessment of Food Sensory Quality. A Practical Guide. A volume in Woodhead Publishing Series in Food Science, Technology and Nutrition, 2013.
- Chen, Jianse (ur.), Engelen, Lina (ur.). Food oral processing : fundamentals of eating and sensory perception., 1st ed. Hoboken : Wiley Blackwell, 2012.
- O'Sullivan, Maurice G. A handbook for sensory and consumer-driven new product development : innovative technologies for the food and beverage industry. Duxford ; Cambridge : Woodhead Publishing is an imprint of Elsevier, 2017

in

aktualni znanstveni in pregledni članki, ki so javno dostopni preko spleta

Cilji in kompetence:	**Objectives and competences:**
Osnovni cilj predmeta je poglobitev specifičnih znanj s področja senzorične in instrumentalne analize. Seznanjanje s tehnikami frakcioniranja vzorca in analizo senzorično aktivnih komponent s sodobnimi metodami GC/vohanje, HTLC/okušanje, E-nos in E-jezik. Usposobitev kandidata za kompleksno razumevanje deskriptorjev hlapnih in nehlapnih aromatičnih komponent (senzorično aktivnih komponent, komponente arome in tuje arome).	The basic educational objective is to deepen specific knowledge in the field of sensory and instrumental analysis. Insight in the fraction techniques of samples and analysis of the sensory active components by the modern sensory and instrumental methods GC/olfactometry, HTLC/gustatory testing, E-nose, E-tongue). Training of candidates for a complex understanding of descriptors of odorous or aromatic components and flavouring substances (sensory active components, component of flavour and off flavour).

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Kandidat je usposobljen za izvedbo raziskav na področju uporabe sodobnih senzoričnih in instrumentalnih tehnik, celovito in kritično ovrednotenje dobljenih rezultatov ter pravilno interpretacijo rezultatov. Kandidat v okviru predmeta pridobi znanje o nastajanju in uporabi podatkovnih baz.	Knowledge and understanding: Intended learning outcomes are to qualify a candidate for the execution of research applying the advanced sensory and instrumental techniques, comprehensive and critical evaluation of the obtained results and the correct interpretation of results. Candidates in this course will acquire knowledge on the generation and use of databases.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, seminarji na temo izbranega primera (case study), laboratorijske vaje.	Lectures, seminars on the topic of the selected case (case study), laboratory exercises.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Študent na izbrani temi pripravi projektno seminarsko nalogo, ki je pogoj za opravljanje izpita;	30,00 %	Students prepare a paper project from the selected theme, which is a prerequisite for the exam;
ustni izpit	70,00 %	oral exam

Ocenjevalna lestvica:	Grading system:
5 - 10, pri čemer velja, da je pozitivna ocena od 6 - 10	5 - 10, a student passes the exam if he is graded from 6 to 10

Reference nosilca/Lecturer's references:

KOROŠEC, Mojca

1. BOLHA, Anja, BLAZNIK, Urška, **KOROŠEC, Mojca**. Influence of intrinsic and extrinsic food attributes on consumers` acceptance of reformulated food products : a systematic review = Vpliv notranjih in zunanjih lastnosti preoblikovanih živil na sprejemljivost med potrošniki : sistematični pregled literature. *Zdravstveno varstvo : Slovenian journal of public health*. [Tiskana izd.]. 2021, letn. 60, št. 1, str. 72-78. ISSN 0351-0026. https://content.sciendo.com/view/journals/sjph/60/1/article-p72.xml, DOI: 10.2478/sjph-2021-0011. [COBISS.SI-ID 47887107], [JCR, SNIP, WoS do 26. 10. 2022: št. citatov (TC): 3, čistih citatov (CI): 3, čistih citatov na avtorja (CIAu): 1,00, Scopus do 14. 1. 2023: št. citatov (TC): 4, čistih citatov (CI): 4, čistih citatov na avtorja (CIAu): 1,33]. kategorija: 1A4 (Z)
2. FERJANČIČ, Blaž, KUGLER, Saša, **KOROŠEC, Mojca**, POLAK, Tomaž, BERTONCELJ, Jasna. Development of low-fat chicken bologna sausages enriched with inulin, oat fibre or psyllium. *International journal of food science & technology*. [Print ed.]. Apr. 2021, vol. 56, iss. 4, str. 1818-1828. ISSN 0950-5423. DOI: 10.1111/ijfs.14808. [COBISS.SI-ID 34231555], [JCR, SNIP, WoS do 6. 12. 2022: št. citatov (TC): 4, čistih citatov (CI): 4, čistih citatov na avtorja (CIAu): 0,80, Scopus do 18. 1. 2023: št. citatov (TC): 7, čistih citatov (CI): 7, čistih citatov na avtorja (CIAu): 1,40]. kategorija: 1A2 (Z, A1/2)
3. PISKERNIK, Saša, LEVART, Alenka, **KOROŠEC, Mojca**, PERME, Kaja, SALOBIR, Janez, PAJK ŽONTAR, Tanja. Fatty acid profiles, nutritional quality and sensory characteristics of unconventional oils and fats on the Slovenian market. *Journal of food and nutrition research*. 2021, vol. 60, no. 4, str. 373-383. ISSN 1336-8672. https://www.vup.sk/en/index.php?mainID=2&navID=34&version=2&volume=60&article=2251. [COBISS.SI-ID 85890819], [JCR, SNIP]. kategorija: 1A4 (Z)
4. POKLAR ULRIH, Nataša, OPARA, Rok, **KOROŠEC, Mojca**, WONDRA, Mojmir, ABRAM, Veronika. Influence of trans-resveratrol addition on the sensory properties of 'Blaufränkisch' red wine : part II. *Food and chemical toxicology*. Mar. 2020, vol. 137, 7 str., ilustr. ISSN 0278-6915. DOI: 10.1016/j.fct.2020.111124. [COBISS.SI-ID 5149048], [JCR, SNIP, WoS do 26. 10. 2022: št. citatov (TC): 2, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0,40, Scopus do 21. 12. 2021: št. citatov (TC): 2, čistih citatov (CI): 2, čistih citatov na avtorja (CIAu): 0,40]. kategorija: 1A1 (Z, A', A1/2)
5. KUHAR, Aleš, **KOROŠEC, Mojca**, BOLHA, Anja, PRAVST, Igor, HRISTOV, Hristo. Is a consumer perception of salt modification a sensory or a behavioural phenomenon? : insights from a bread study. *Foods*. 2020, vol. 9, iss. 9, 1172, str. 1-24, ilustr. ISSN 2304-8158. https://www.mdpi.com/2304-8158/9/9/1172, DOI: 10.3390/foods9091172. [COBISS.SI-ID 29268739], [JCR, SNIP, WoS do 22. 12. 2022: št. citatov (TC): 5, čistih citatov (CI): 5, čistih citatov na avtorja (CIAu): 1,00, Scopus do 22. 12. 2022: št. citatov (TC): 6, čistih citatov (CI): 6, čistih citatov na avtorja (CIAu): 1,20]. kategorija: 1A1 (Z, A'', A', A1/2)
6. BERTONCELJ, Jasna, POLAK, Tomaž, PUCIHAR, Tina, LILEK, Nataša, KANDOLF BOROVŠAK, Andreja, **KOROŠEC, Mojca**. Carbohydrate composition of Slovenian bee pollens. *International journal of food science & technology*. [Print ed.]. 2018, vol. 53, str. 1880-1888. ISSN 0950-5423. DOI: 10.1111/ijfs.13773. [COBISS.SI-ID 4886904], [JCR, SNIP, WoS do 9. 1. 2023: št. citatov (TC): 17, čistih citatov (CI): 16, čistih citatov na avtorja (CIAu): 2,67, Scopus do 4. 12. 2022: št. citatov (TC): 16, čistih citatov (CI): 15, čistih citatov na avtorja (CIAu): 2,50]. kategorija: 1A2 (Z, A1/2)